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Rawlplug rapid boring tools produce holes in all forms of masonry in less time than any comparable type. Tools are available for use with electric or pneumatic drills, or as hand drills. Standard sizes range from ¼" diam. to 2½" diam. and many types are made, spiral fluted or straight fluted and with or without DURIUM hard tips.

Rawlplug masonry tools are the fastest cutting of their type, with the longest life.

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Rawlbolts are the fastest and most secure method of making Bolt Fixings into any form of masonry.

THE RAWLPLUG COMPANY LIMITED
CROMWELL ROAD · LONDON · S.W.7
The world's largest manufacturers of fixing devices

B.713

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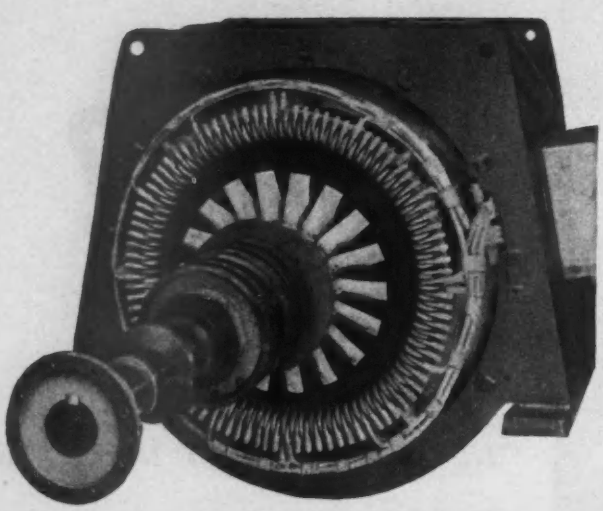
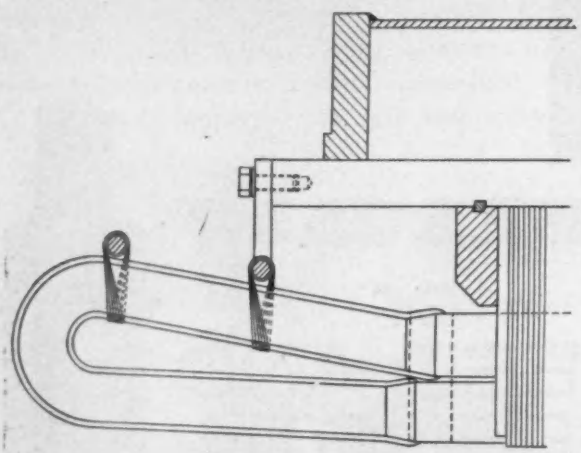


There comes a point in every design where the practical takes over from the theoretical. Up to this point all equipment of the same kind is—potentially at least—the same because theory is common ground. Beyond it success depends largely on experience; on having done the job many times before. It is here that the differences between motors with the same specified performance show up, and the word performance itself takes on the wider, vaguer, but essentially more realistic, meaning which includes those things—robustness, reliability, ease of maintenance—which an engineer has in mind when he thinks of a first-class job.

This thing called know-how



A very simple example of this essentially empirical approach is provided by the bracing and anchoring of the end windings of large A.C. motors. Many such machines are required to start direct-on-line or to have to deal with arduous braking duties. In these circumstances, the forces between coils are very considerable and the design of the end bracing is particularly important. It might well be thought that the windings would be most effectively braced at their outer ends, but experience has shown that this is not so. The forces are greatest about half way along the out hang and the greatest stability is achieved when a frame-anchored bracing ring is placed at this point. A further unanchored ring is fitted at the coil evolutes. It is in detail of this kind that a manufacturer's experience shows itself.

Crompton Parkinson LIMITED

Makers of Electric Motors of all kinds A.C. and D.C. Generators, Cables, Switchgear, B.E.T. Transformers, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

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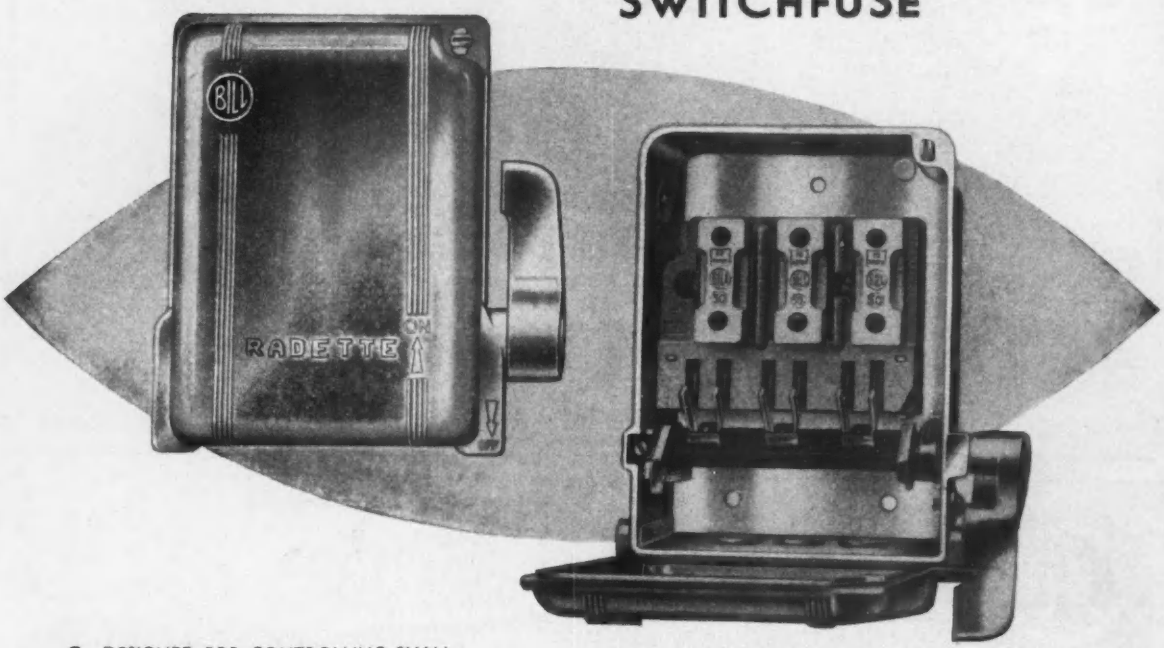
BILL RADETTE Q1438 MARK II

THE MODERN MOTOR CONTROL SWITCHFUSE



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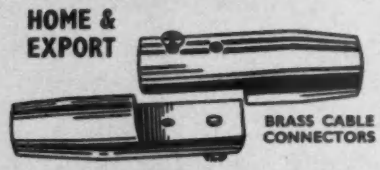
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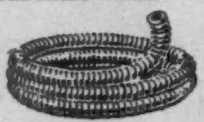
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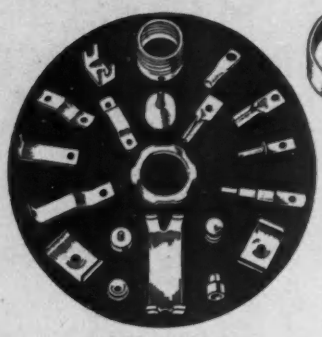
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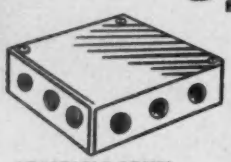
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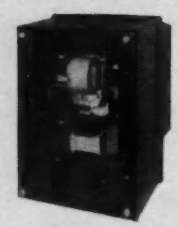

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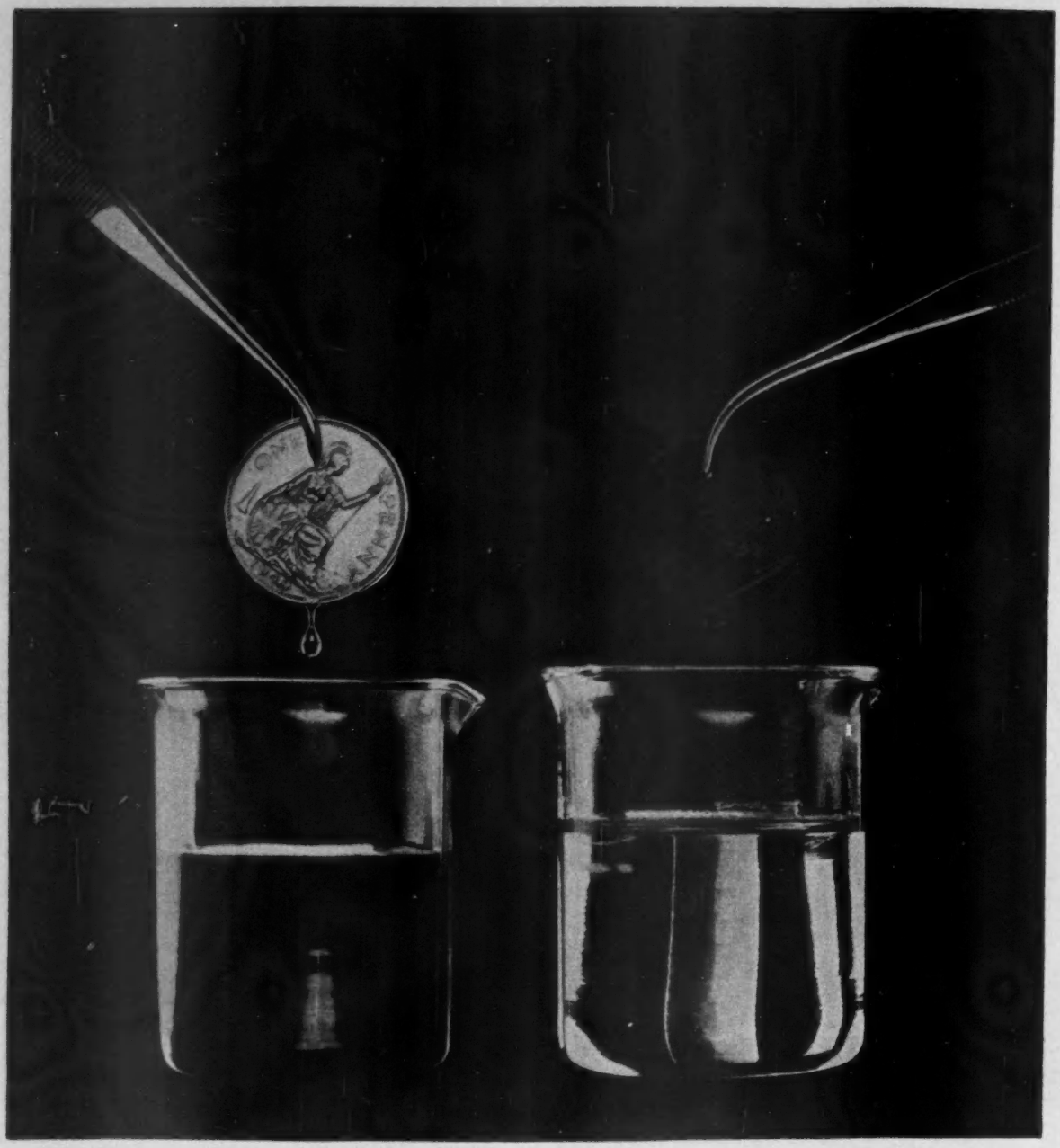
W&W 81

Shell demonstration



Two clean, bright pennies are placed in beakers of oil, of equal performance level, one Shell Garia Oil 21, the other a conventional cutting oil containing sulphurised additives. After three hours at room temperature one penny is still bright and stain-free, the other heavily stained with black copper sulphide. The bright penny is from the beaker containing Shell Garia Oil 21, the blackened one from that containing the conventional oil. While these were just pennies they could have been bronze bushes in your machine tools—stained in less than half a shift. Sulphur is essential in heavy-duty cutting oils. Special additives in Shell Cutting Oils protect your machine tools and yet allow the sulphur to do its job. *Write for the book "Selecting Your Cutting Oils" to Lubricants Department, Shell-Mex House, London, W.C.2.*

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SHELL CUTTING OILS

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Otter 'PUP'

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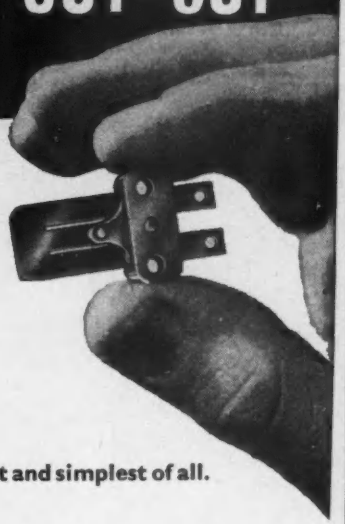

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* Has only one moving part.
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* They PRESS their contacts together to open them with a snap!
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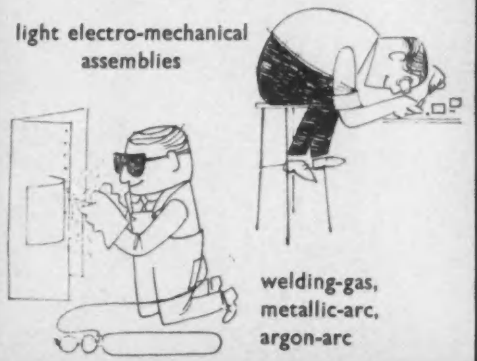

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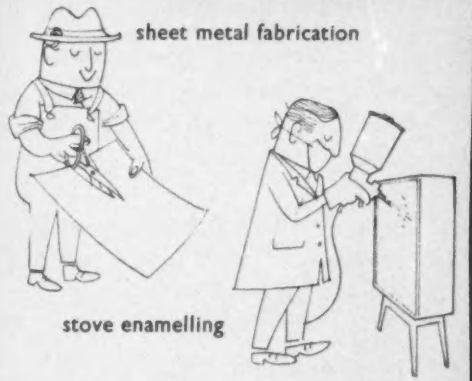

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5 amp. Single Pole to B.S.2652 (one and two-way) or 15 amp. Double Pole (with or without neon indicators).

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Circular have integral moulded blocks for surface mounting or can be without mounting blocks for small circular conduit boxes to B.S.31.

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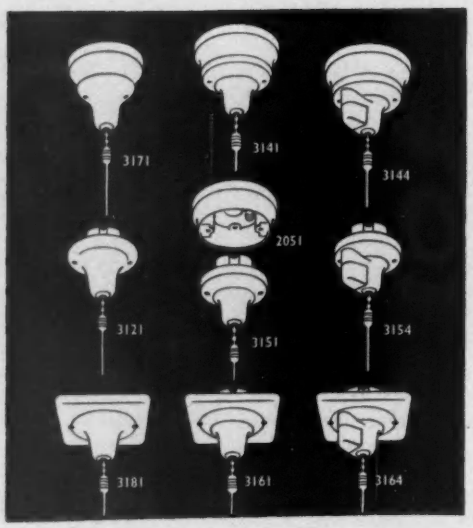
15 AMP.—DOUBLE POLE



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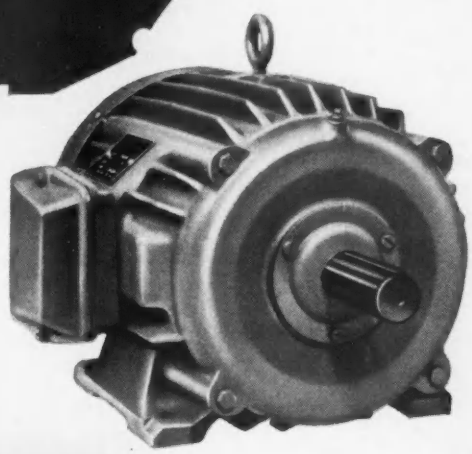
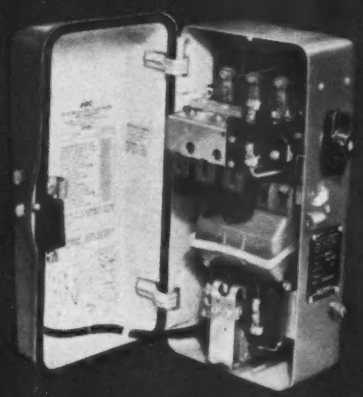
range of
and starters





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Including British Standard ventilated 'C' frame (to B.S. 2960) and totally enclosed 'B' (to B.S. 2083) and 'D' frame (to B.S. 2960 pt 2) motors. Matching direct-to-line non-reversing and reversing) and star-delta starters.

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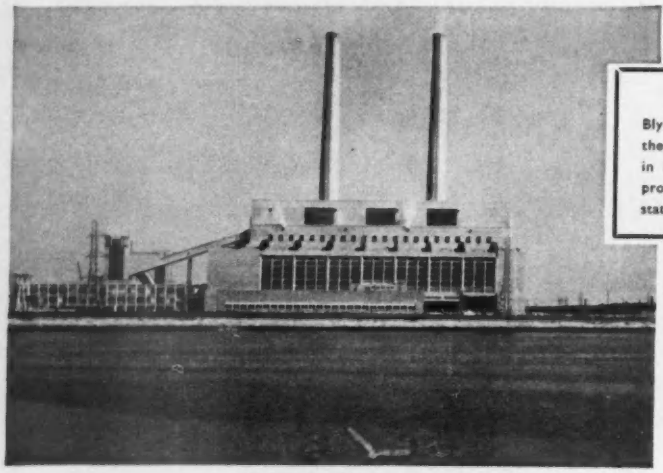

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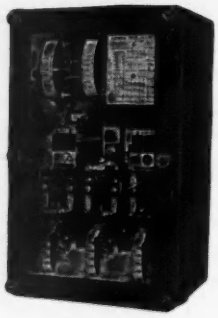

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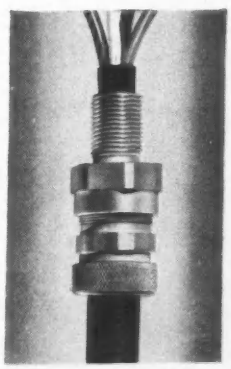
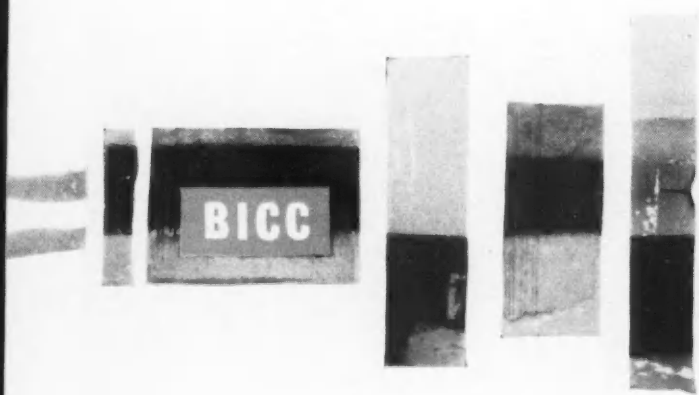
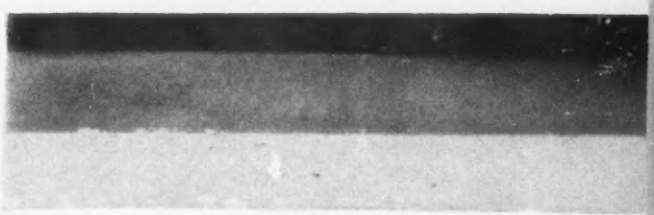


The gland illustrated is fitted with under-armour and outer-sheath seals and can be used on S.W.A. and wire braided cables.





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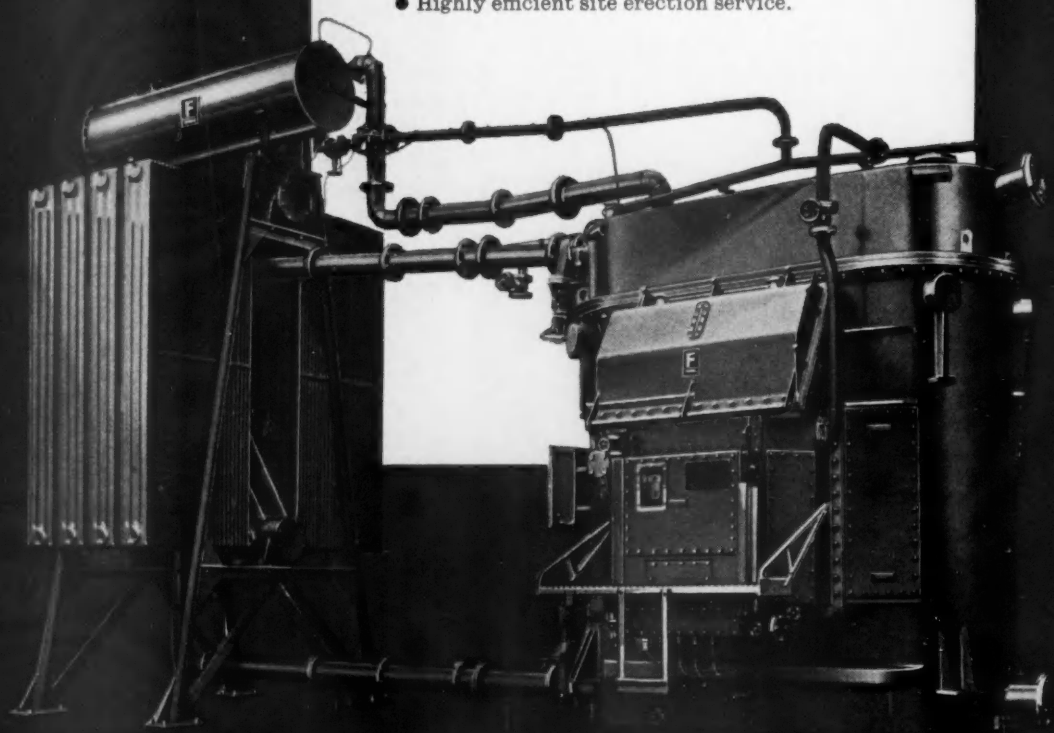

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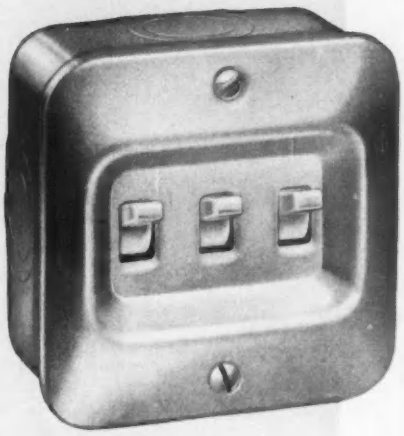

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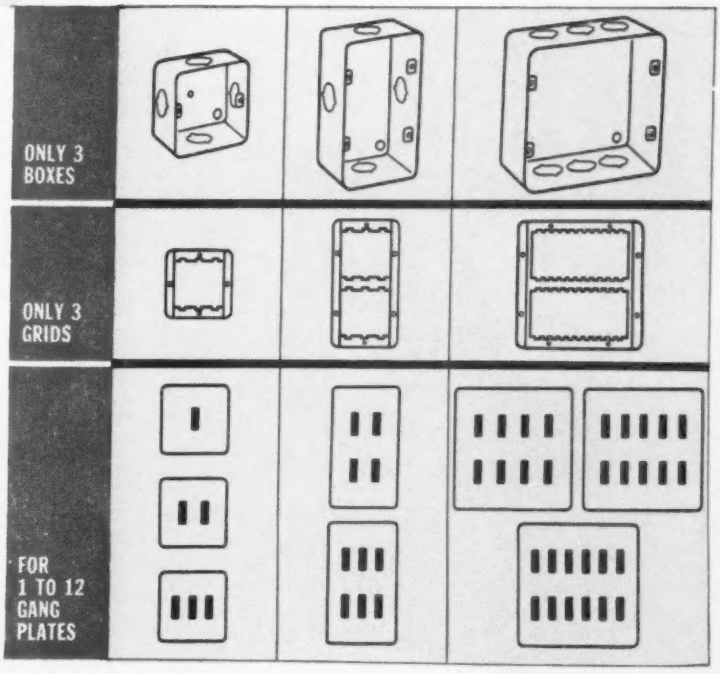

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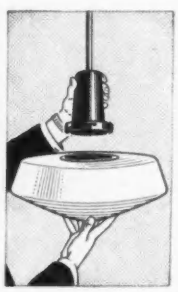

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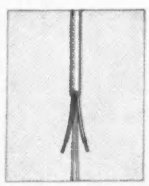
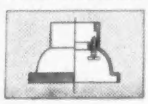


EXECUTIVE suspensions in ten different lengths are either ½ in. silver anodised aluminium tube or this new steel reinforced white flexible. (Patent applied for).

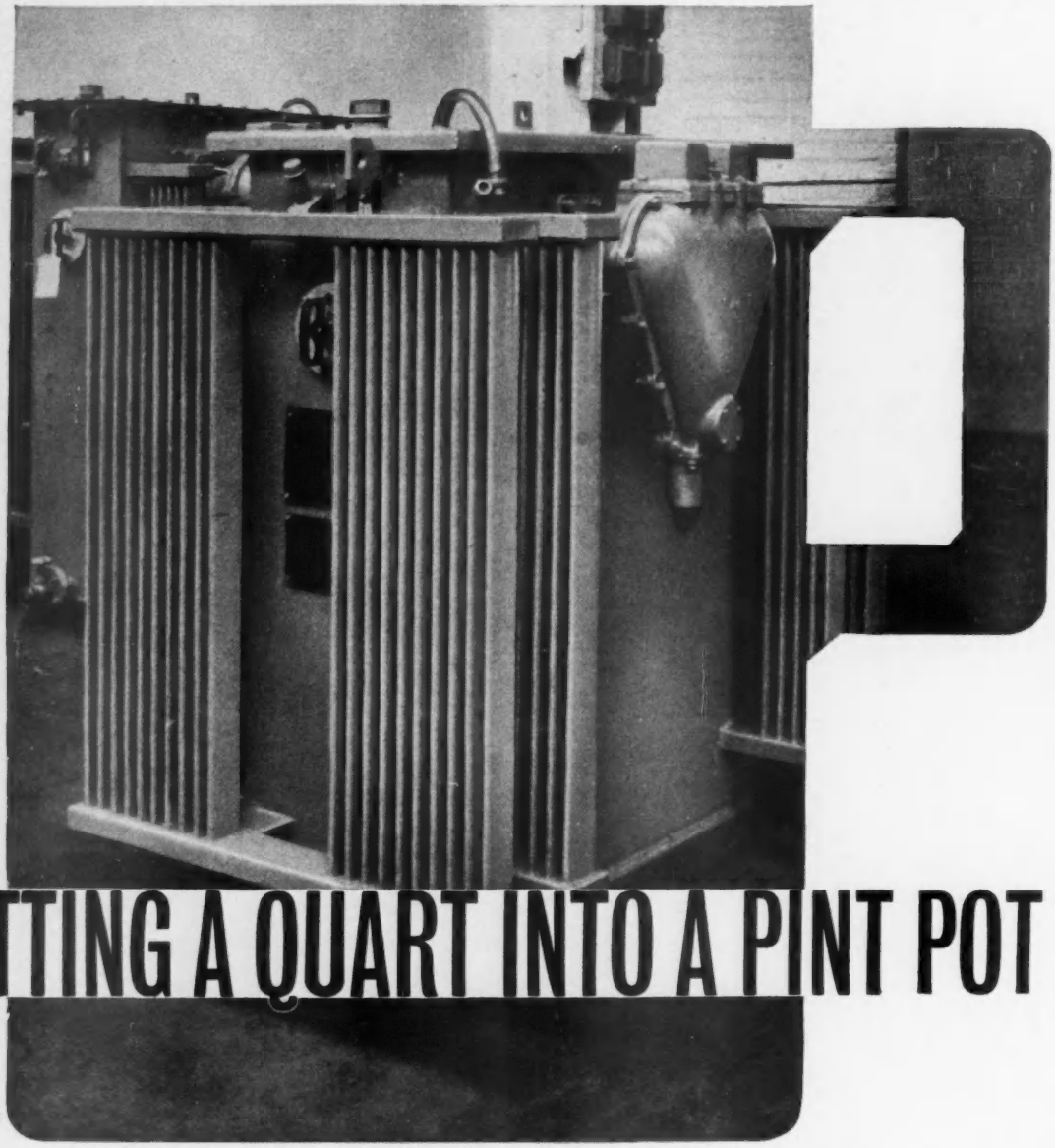


Internal locking screw on lampholder prevents unscrewing when relamping.

EXECUTIVE

by G.E.C.

LIGHTING & HEATING GROUP, THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



GETTING A QUART INTO A PINT POT

The compactness of the present range of Brush T.1. Distribution Transformers will be particularly appreciated by authorities who find it necessary to increase output of their existing transformer sub-stations to meet increasing demands for power, without carrying out major alterations to buildings. A modern Brush 500 kVA transformer can be placed in a sub-station building originally designed for a 300 kVA transformer, with room to spare for housing the larger associated switchgear. Besides being extremely compact this new series of T.1. Transformers greatly reduce noise level.

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Plans for approving Canadian electrical equipment to BS, with testing in Toronto, under consideration, as BSI-CSA scheme in UK becomes more British. (702, 727)

Third harmonics used for excitation of large alternators. Extra winding on stator generates power from harmonics in flux wave, rectified output feeds rotor. Supply to boiler feed pump at triple frequency also possible, say US engineers. (702, 719)

Review of ERA research in 1960 notes investigations on transformer oil oxidation, extension of steam tables, interest in synthetic testing of circuit-breakers and extended surge phenomena studies on h.v. systems. ERA willing to accept test or research contracts from non-members as well as members. (701, 714, 729)

GEC and Richardsons, Westgarth pool resources for thermal power. No financial tie-up, but agreement extends over design, development, sales and manufacture. (726)

Bulgaria and Hungary to send us electrical goods. New quota agreement allows import of motors, transformers and accumulators from Bulgaria and lamps, valves and domestic appliances from Hungary. (730)

£3m test facilities for nuclear station components used for Hinkley Point plant. Full-scale models of atomic furnace sections used for testing charge-discharge appliances and techniques. (709)

BEAB approve only nine shavers, one toaster in second list. Six fires and six vacuum cleaners added to earlier approvals list. (701, 727)

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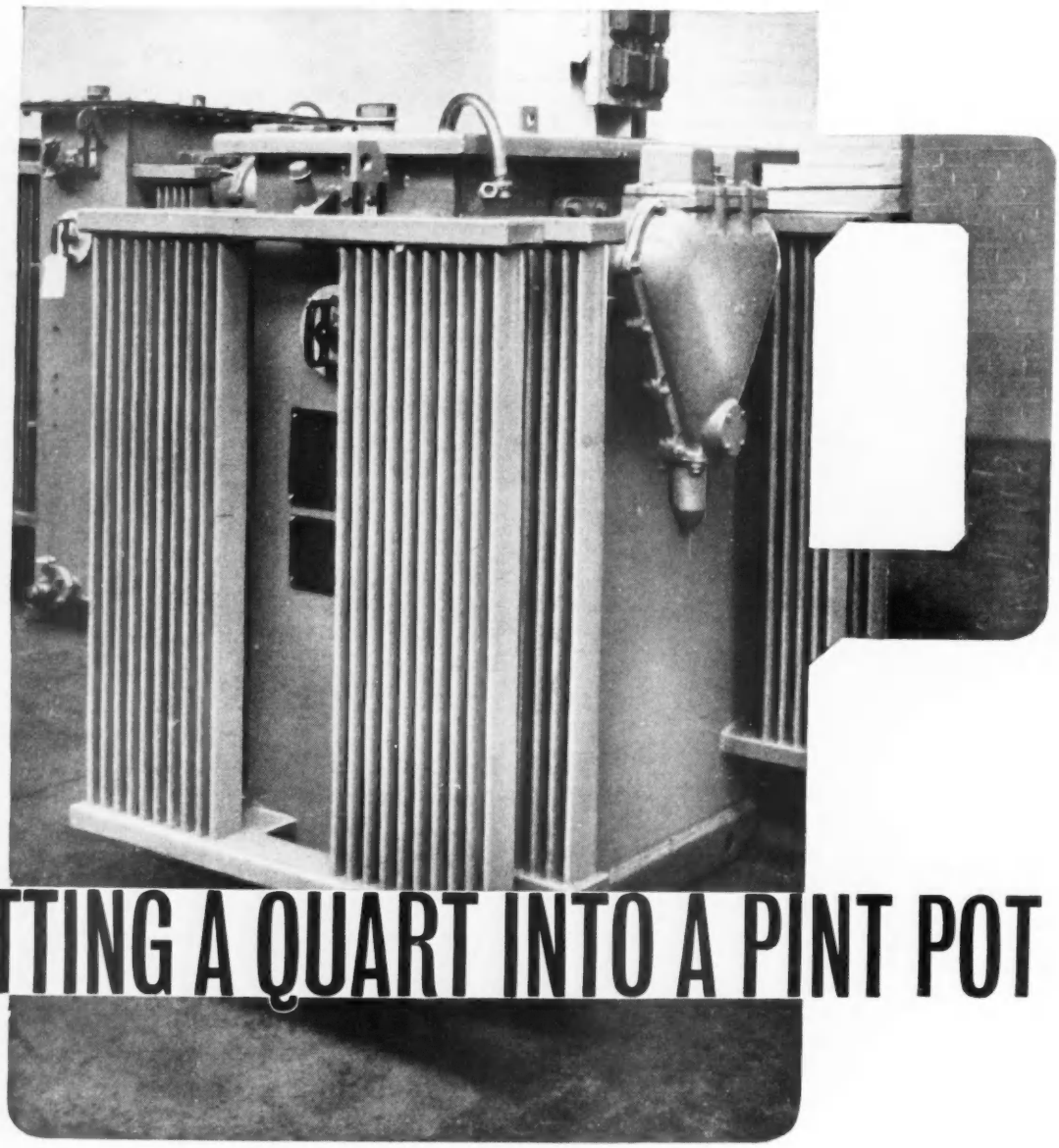

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NEWS SHEET

Mach 2·5 to 5 flows obtained in supersonic wind tunnel with servo-controlled flexible nozzle. 34 10,000-lb screwjacks, Magslip controlled from cam gauges, used to position flexible wall plates to 0·001 in. (703)

Axially placed condensers for 500 MW sets planned, to permit stronger support for turbines. Single water pass used for single-shell units. (707)

Eire Board justified in cutting off supplies to two wholly separate premises, but owned by one consumer, when one bill was unpaid, Dublin Supreme Court rules after appeal. (728)

BEAMA form two new sections covering industrial electronic equipment and nuclear reactors. (729)

Wood pole lines for 345 kV with live line maintenance described in American Power Conference papers; also radio interference studies. (720)

30,000 lumens/100 lin ft for ring road, four-and-a-half times maximum recommended in C.P.1004, adopted for new through-traffic route round central Birmingham. (710)

Advanced gas-cooled reactor at Windscale completed by July, predict UKAEA. Full loading by late autumn, with 20% of first charge beryllium canned. (726)

Tax on technical know-how agreements with foreign companies: Court of Appeal reverses earlier judgment for Rolls-Royce. Case to go to Lords. (731)

BUSINESS—GEC form three new subsidiaries (726) . . . Electric cooker and combined cooker/fridge coming from Cannon (726) . . . Bastian get order for 18 MW electrode boiler for Newfoundland (729) . . . C. A. Parsons expect "fairly high" profits in 1961 . . . Aberdare reports good year for South Wales Switchgear . . . R. and A. G. Crossland lift dividend . . . Scrip issue and steady dividend by T. Clarke . . . Drayton Regulator pays 2½% more with record profit . . . Dewhurst and Partner propose scrip issue of non-voting shares . . . Net profit of Power Securities drops from £626,473 to £374,717, but dividend stays at 15% . . . Difficult trading continues for Bylock. (734)

OVERSEAS—New Brunswick survey reveals site with 500,000 h.p. hydro potential . . . Profits up for Southern Canada Power and Calgary Power . . . Trinidad and Tobago envisage $45 million World Bank supply development loan . . . Argentine 600 MW station under construction by British firms delayed, private ownership proposed by Government . . . Pressing need for power in India . . . Australia's first natural gas power station at Roma in operation. (732, 733)

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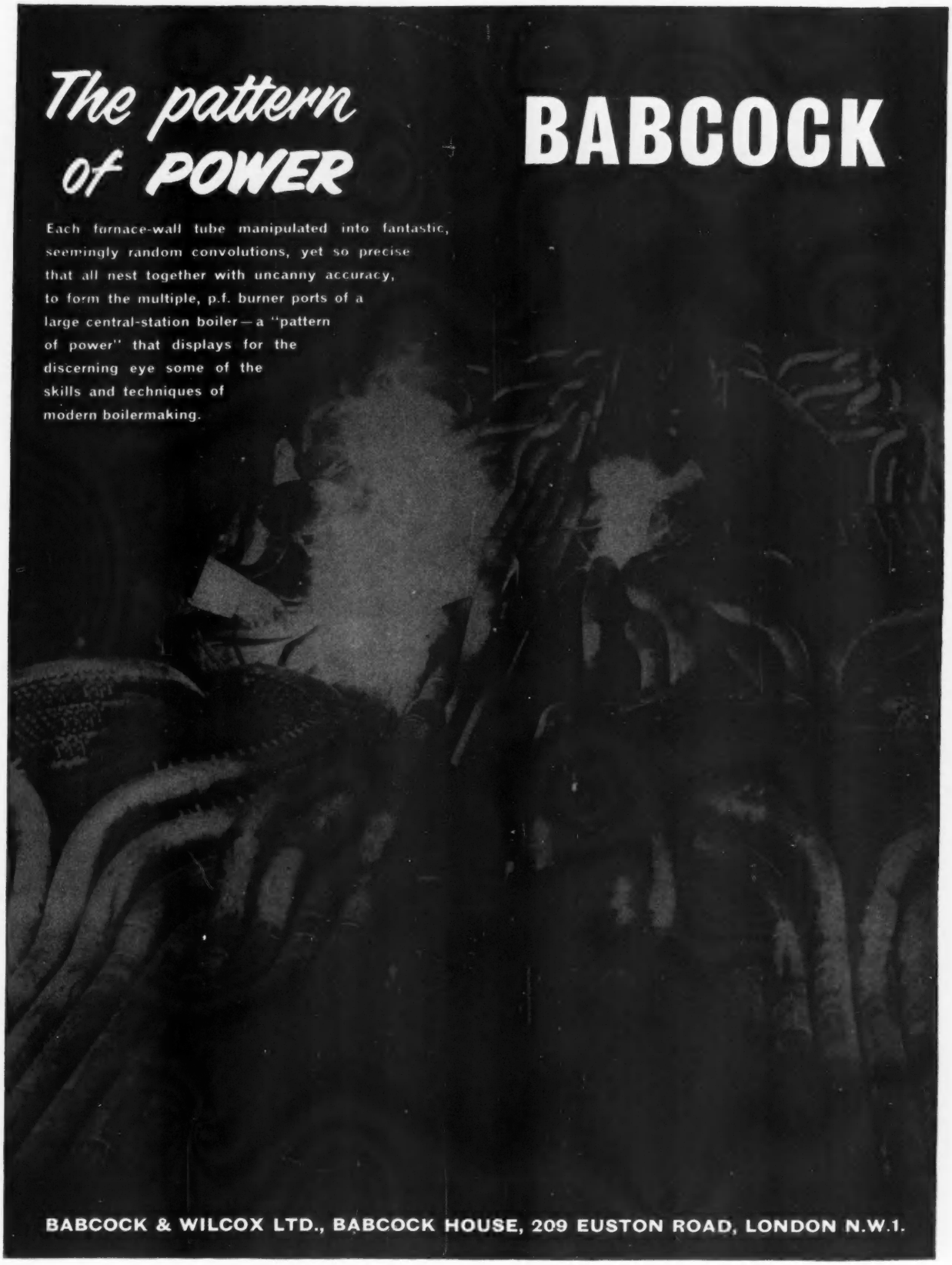

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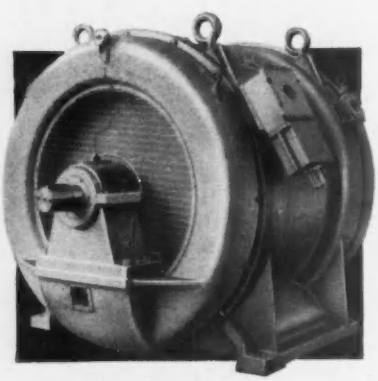

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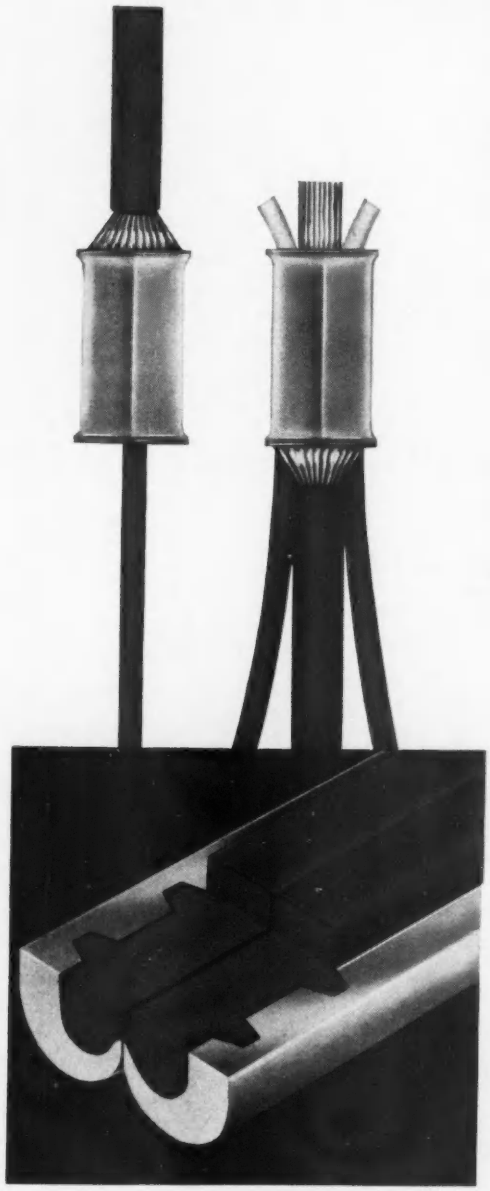

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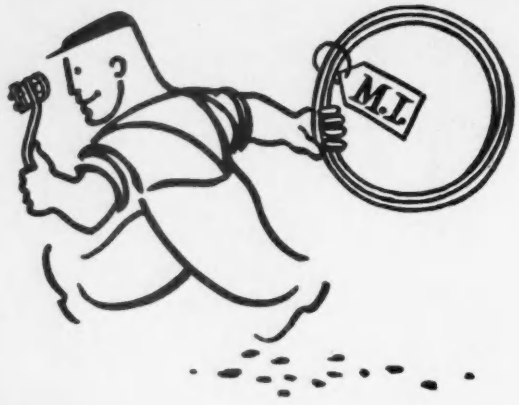

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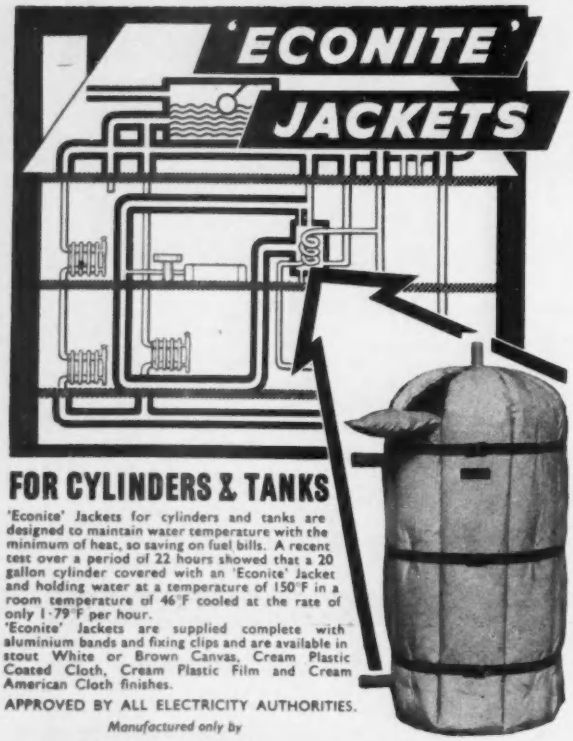

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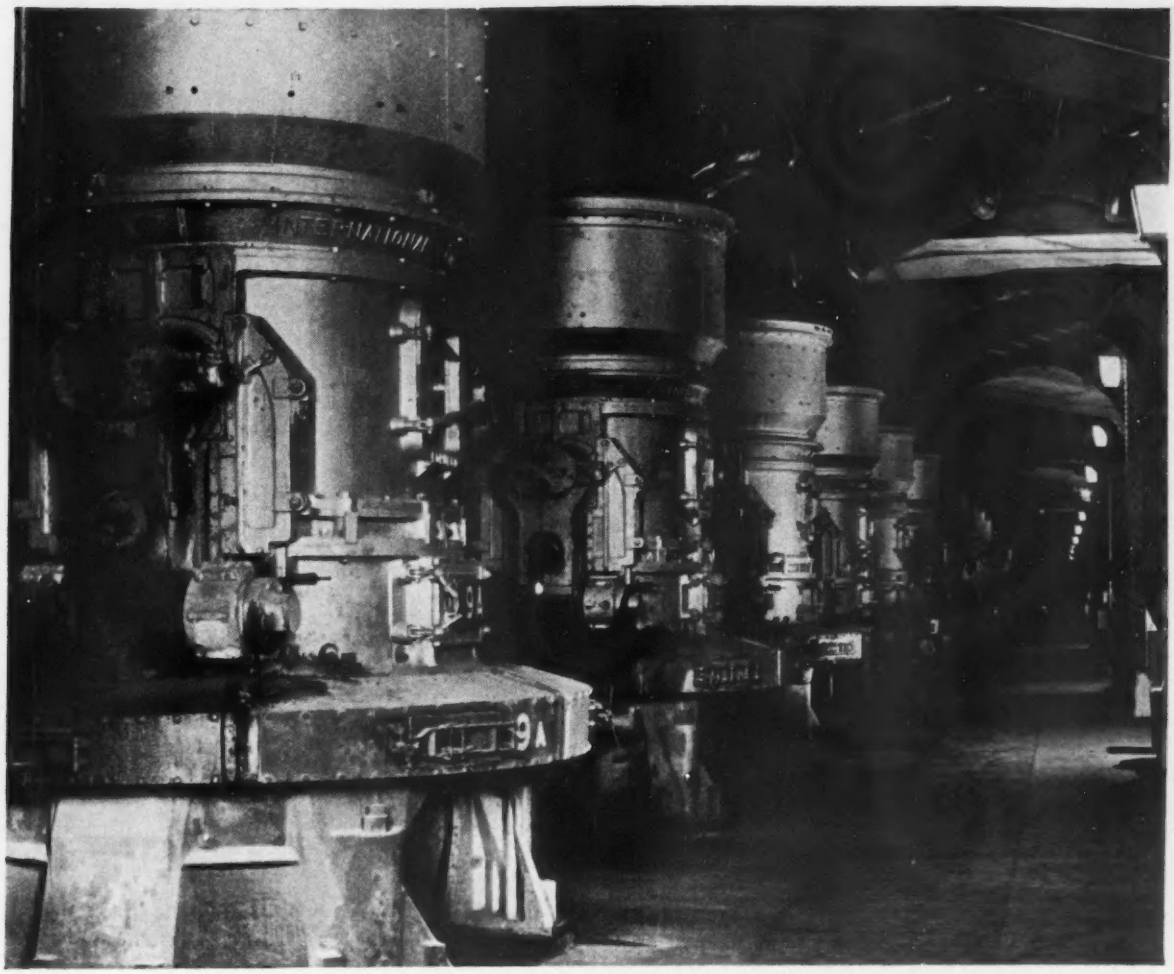

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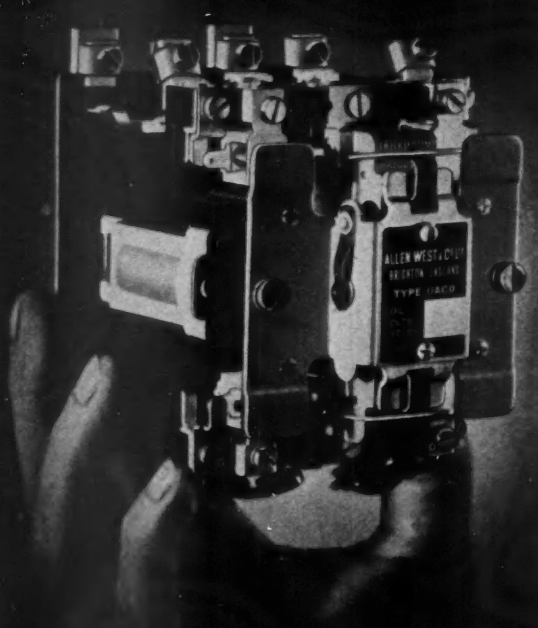

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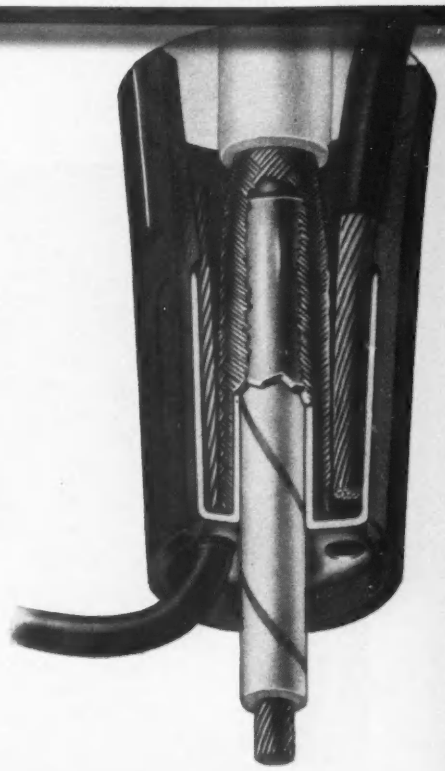
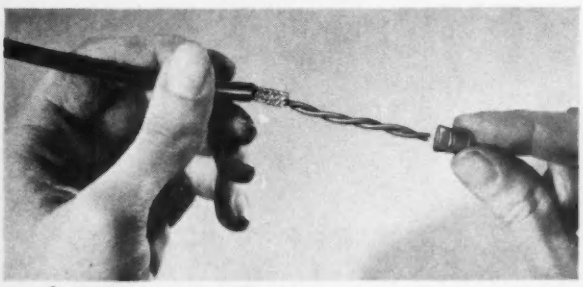
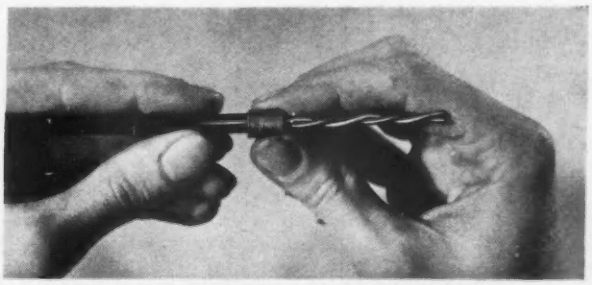


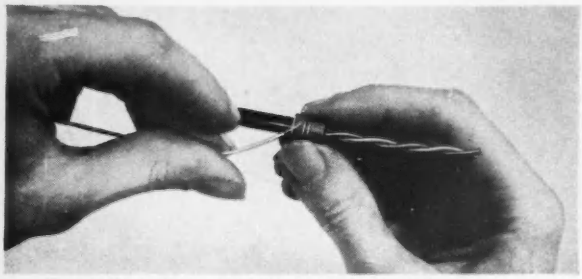
Uniring Connectors simplify coaxial cable installation



Screen diameter is eased by rotating conductor.



Uniring is fitted with inner sleeve sliding under the conductor screening, and over the insulation.



Tap conductor is inserted between conductor screening and outer sleeve.

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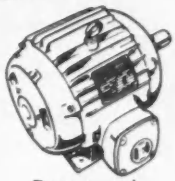
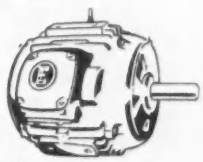
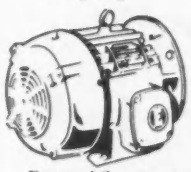


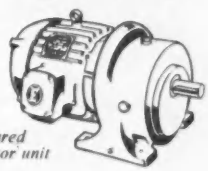
Foot mounted



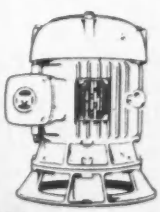
Pad fixing



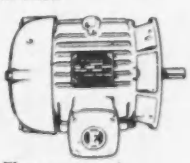
Foot and flange mounted



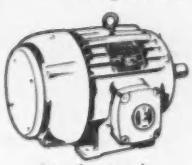
Geared motor unit



Skirt mounted



Flange mounted



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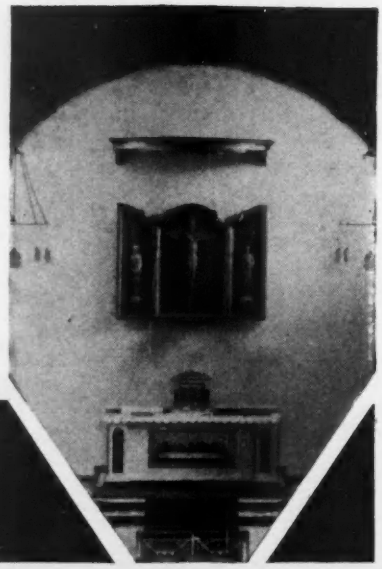

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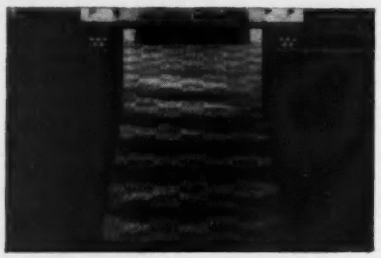

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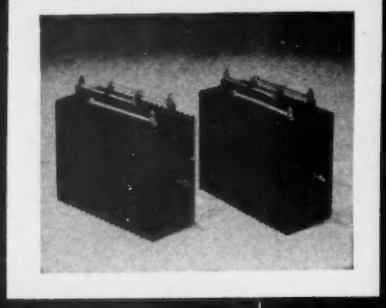

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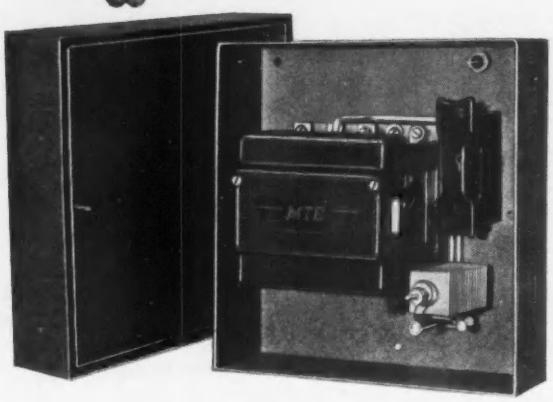

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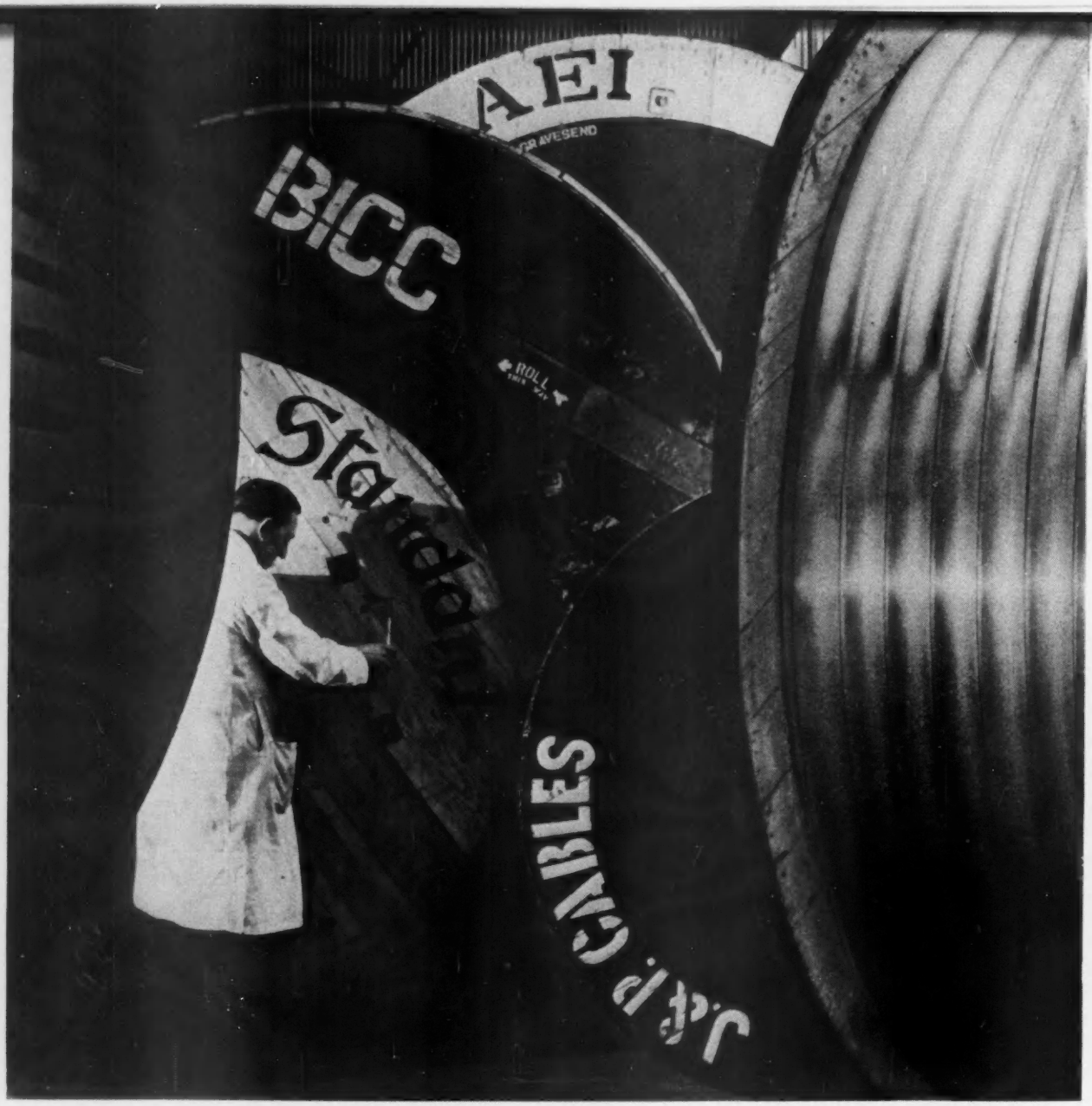

Aluminium sheathed cables—a growing market

OVER 100 miles of aluminium tube is rolled on to drums like these at Rogerstone, Monmouthshire, every month; it goes to cable makers all over England. More material leaves in the form of strip, for those cable makers who make their own tube by seam welding. These tubes become sheathing for insulated cables.

Four main classes of cable are being made with aluminium sheaths.

Supertension Power Cables

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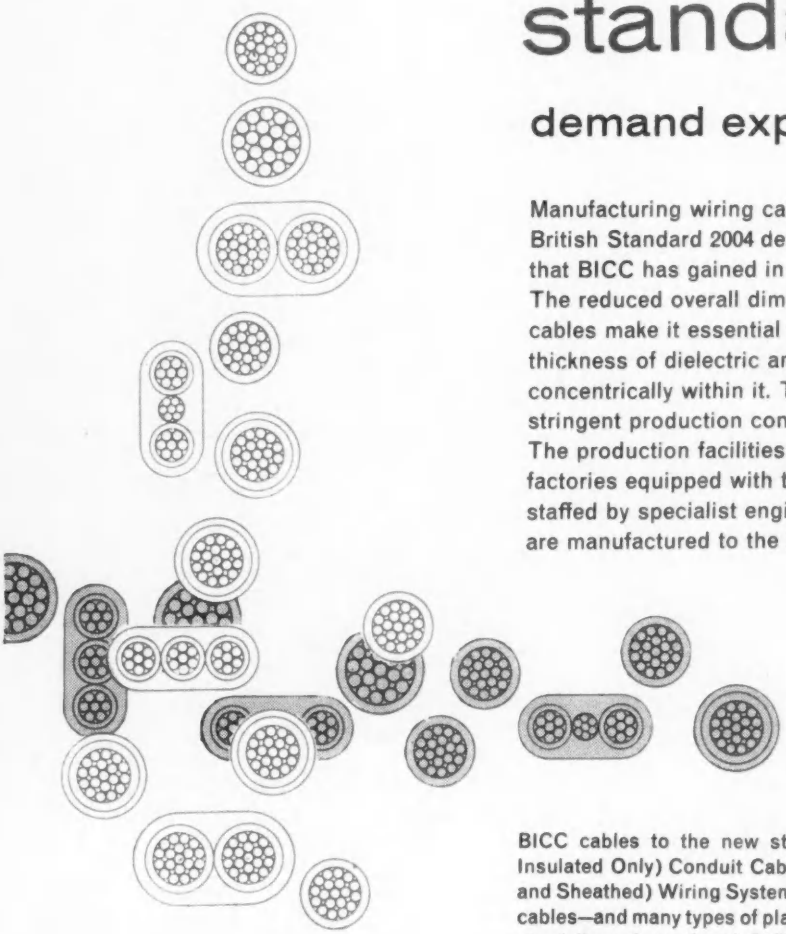

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THURSDAY 4 MAY, 1961
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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Simulation des écoulements supersoniques ... 703

Nouvelle soufflerie du Royal Aircraft Establishment, dont le numéro du 6 avril comporte une description, se limite pour le moment aux écoulements opérationnels de dépassant pas Mach 4. Grâce à l'adjonction d'un système de plaques flexibles à orifice, actuellement en construction, la gamme atteindra Mach 5, et tout écoulement compris entre Mach 2,5 et 5 pourra s'obtenir par servo-réglage automatique. L'ajustage est effectué par des vérins agissant sur les plaques flexibles qui constituent l'orifice, et dont le déplacement coordonné est commandé par des cames et des galets de came, par l'entremise d'un système d'asservissement. D'autres systèmes d'asservisement fournissent au pupitre de commande une télé-indication sur la configuration du venturi, l'ouverture du diffuseur, et le comportement de la maquette.

Recherche électrique coopérative 714

Un compte rendu des travaux effectués en 1960 par l'Electrical Research Association fait état de l'étude relative à l'oxydation des huiles de transformateurs, et de la recherche d'une méthode satisfaisante pour l'essai synthétique des disjoncteurs. Les renseignements relatifs aux propriétés de la vapeur ont été portés à 408 kg/cm², 750°C, la chaleur totale étant déterminée avec une précision de 0,1%. D'après les études effectuées sur les phénomènes des à-coups, l'atténuation de ceux-ci quant aux câbles de 11kV sur poteaux en bois, est relativement faible comparée à celle des câbles sur tours en acier.

Centrale électrique d'Elland 716

La centrale électrique d'Elland, dans le Yorkshire, fonctionne sur une charge de base, avec une efficacité de 30% se basant sur les unités distribuées. La centrale comporte trois ensembles turbo-générateurs de 60 MW alimentés par trois chaudières distinctes. Conditions de la vapeur aux soupapes d'arrêt des turbines 63,3 kg/cm² et 482°C. Les trois chaudières peuvent fournir nominalement 250 kg/heure. L'eau de refroidissement provenant d'une rivière avoisinante est augmentée par l'eau fournie depuis deux tours de réfrigération hyperboliques en béton, dont la capacité totale est de 35,4 millions de litres/heure.

In dieser Nummer

Nachbildung von Ultraschall-Luftströmen 703

Der neue R.A.E. Windkanal, der in der Nummer vom 6 April beschrieben wurde, ist vorläufig noch auf Betriebsströme von unter Mach 4 beschränkt. Die Einverleibung eines mit biegsamen Platten bestückten Düsensystems, an dem jetzt gebaut wird, soll den Strömungsumfang auf Mach 5 steigern, wobei jede beliebige Strömung zwischen Mach 2,5 und 5 mittels automatischer Servosteuerung einstellbar ist. Diese Einstellung erfolgt über Stellschrauben, die auf biegsame, die Düse bildende Platten einwirken und deren koordinierte Bewegung über ein Servosystem mit Nocken und Nachfolgern geregelt wird. Weitere Servosysteme liefern am Bedienungspult Fernanzeigen über die Form der Strömungsöffnung, den Lufttrichter und die Lage des Modells.

Gemeinschaftliche Forschung im Kraftwesen ... 714

Ein Uberblick über die von der Electrical Research Association im Jahre 1960 geleistete Arbeit erwähnt die Oxydierung von Transformatorölen sowie Bestrebungen, die sich auf die Entdeckung einer zufriedenstellenden Methode zur synthetischen Prüfung von Leistungsschalter richten. Die Kenntnis der Eigenschaften des Dampfes wurde auf 408 kg/cm² bei 750°C ausgedehnt, wobei der Gesamtwärmebetrag mit einer Genauigkeit von 0,1% ermittelt werden konnte. Stosswellenuntersuchungen ergaben verhältnismässig geringe Anderungsgeschwindigkeiten für die Stosswellendämpfung bei 11 kV-Leitungen mit Holzmasten im Vergleich zu Stahlturmleitungen.

Das Elland Kraftwerk 716

Das 120 MW Kraftwerk bei Elland, Yorkshire, arbeitet bei Grundlast mit einem Wirkungsgrad von 30%, wenn man von Einheiten ab Werk ausgeht. Es besitzt drei 60 MW Turbogeneratorensätze, die mit Kesseleinheiten betrieben werden. Die für die Turbinensperrventile massgebenden Verhältnisse sind 63,3 kg/cm² und 482°C. Die drei Kessel haben eine Nennleistung von 250 kg/h. Kühlwasser von einem benachbarten Fluss wird ergänzt durch Speisung von zwei hyperbolischen Betonkühltürmen mit einer Gesamtleistung von 35,4 Millionen Litern pro Stunde.

Achieving Mach 5 Test Flow 703
by E. P. Von Bergen, M.A.

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Lighting the Inner Ring 710

Forty Years of the E.R.A. 714

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SUBSCRIPTION RATES: United Kingdom £4, Overseas £4 10s per annum. Canada and USA $12 per annum. Subscriptions are payable in advance and may commence with any issue. Overseas subscriptions may be paid by banker's draft, cheque, international money order or credited to the Electrical Times Ltd., at Coutts and Co., 440 Strand, London WC2. Single copies price 1s 6d. Postage 6d.

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 4 MAY, 1961

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Comment

SLOW GOING FOR BEAB

This week, the British Electrical Approvals Board for Domestic Appliances has issued its second list of approved appliances. Its contents are nine shavers and one toaster; and six fires and six vacuum cleaners added to the earlier list of approvals. That makes disappointing reading. At first sight, either manufacturers are not submitting their appliances for test, or existing models do not comply with the British Standards to which BEAB has to test, and are failing to secure approval. It seems likely, in fact, that both situations are arising. Manufacturers are hanging back in seeking BEAB endorsement, not only because they may have doubts about its commercial value, but also because they anticipate modifying existing models. They do not want to pay their £50 or so for approval and then be able to use the mark for a short while only. In this they may be miscalculating the effect on the public when the BEAB mark comes into use on approved appliances and shop assistants are asked why some appliances are approved, others not. But this apart, it seems clear that several appliances confidently submitted to BEAB have been failed. It may be possible to bring many of these into line with BS requirements, but meanwhile they have missed the first announcement of their class. Although it is disturbing that some manufacturers who thought they were marketing a BS appliance were unwittingly not doing that at all, rejections are a healthy indication that BEAB means business. Moreover, the Board is offering advice on adjustments rather than brusquely refusing approval with little explanation. Yet although the smallness of the approved list can be explained, the disappointment it occasions is not so easy dispelled. A more vigorous approach from manufacturers seems needed if the industry is to reap the benefits an approvals scheme can bring.

RESEARCH EFFORT FOR SALE

The Electrical Research Association, whose fortieth annual report we summarise on a later page, is showing an acceptable liveliness these days. While its senior officials increasingly travel the world seeking closer contact with new and prospective overseas members and their problems, an attack is being mounted on the home market, to make better use of the expanding facilities at Leatherhead and other ERA laboratories. The Association is proclaiming, in its house journal, its willingness to embark on sponsored research or testing. This service is being offered not to members alone, but to all electrical organisations. It is a development which is not entirely new: ERA has for long conducted some investigations

outside its normal programme and under special financial arrangements. Something on a different scale seems envisaged now. It is worth recalling in this respect the opinion expressed by the Association's director, Dr H. G. Taylor, in an interview with the ELECTRICAL TIMES last year. It is that there is no call to limit the amount of specially sponsored and self-supporting research, provided all funds available for general research are being fully deployed for current activity. The present ERA situation seems to answer this criterion, although with new research committees gradually coming into effective operation an increase in ideas for research may perhaps be expected, and this future work load will have to be considered as well as the present condition. With the cost of research rising, but the need for it in electrical development lessening not at all, the increased facility for contract research is a useful service for industry.

PUTTING HARMONICS TO WORK

The development of semiconductor rectifiers has made practical a number of alternatives to a rotating d.c. machine for the excitation of even the largest generators. It has become practicable to operate with rectification of alternating current picked off the generator output, or with rotating rectifiers providing a brushless scheme. Now the third harmonic voltages, inevitably present in the flux wave of a large machine, are being harnessed to this end. An American paper which we summarise on a later page describes experiments using an extra winding on an alternator stator, connected to generate a third harmonic voltage, which can then be rectified and fed to the rotor. The advantage of such an arrangement is that the excitation requirements are obtained not only without an extra rotating machine, but also without any increase in the excitation provided for the main machine. It is estimated that harmonics in the flux may amount to as much as 9% of fundamental frequency component. This satisfies excitation requirements well enough, and there is the additional advantage that the output wave of the alternator is actually more pure, because the third harmonic winding reduces the triple-frequency component in the main output. A 25·6 MVA machine which can test the new technique thoroughly is scheduled for operation later this year. Looking further ahead, those concerned are still more ambitious. There may be enough recoverable third harmonic to drive the boiler pumps for a large set at the mechanically attractive higher speed offered by three times fundamental frequency.

PROTRACTED CEREMONY

Ceremony has its place in public institutions, but it can be time-consuming. That is a price to be paid for the greater profit a proper sense of esteem can bring. But were our near neighbours in the Savoy Place audience at last week's IEE Kelvin Lecture alone in thinking there was too much ceremony before that lecture? Three-quarters of an hour it was, embracing the presentation of some of the Institution's highest awards, and the giving of some of its more everyday prizes, to which was added the routine welcoming of new corporate members that proves so difficult to stage effectively. To impose so long a wait on a distinguished lecturer from outside the Institution's membership seems questionable. To wish it on the general membership is to discourage them from attending meetings when their object is to get technical information for use or entertainment. The Kelvin Lecture meeting is exceptional as an occasion for presentations, but it seems that the time may have come when it should be made more exceptional still. It might be used as an occasion for restricted presentations only, with some other time—not necessarily immediately before an important technical meeting—found for the remaining functions. Although old ways should not be too hurriedly discarded, delays such as those last week sit uncomfortably on an audience which should include many young engineers.

RECIPROCAL APPROVAL WITH CANADA

Approvals activity in Canada, backed by Government regulations, is a far more lively affair than in the UK. The BSI-operated Canadian Standards Association agency scheme has for over ten years made matters manageable in this respect for British manufacturers of electrical equipment who wanted to export to Canada. Provision for initial inspection in Britain to check compliance with the Canadian code has saved much journeying to and fro. Now the British element of the scheme is being extended. Routine inspection of factory production, a feature of the Canadian scheme which aims at ensuring sample quality is maintained in production, is in future to be carried out by BSI engineers. Accordingly, the CSA office in London has been closed. More than this, negotiations between BSI and CSA have prepared the ground for a two-way approvals scheme. BSI report that a start has been made on providing Canadian manufacturers with the same sort of on-the-spot approvals service that their British counterparts get. It is hoped that the CSA Toronto test house will soon be offering approval and certification to British specifications for appliances and equipment destined for the British market. Such a move is welcome, although the range of British requirements is at present rather wide and not so tightly codified as the Canadian rules. It is extending, however, in both industrial and domestic fields, so that facilities for local approval are likely to be timely. There is another aspect of the development that should not escape notice. The stirring of interest in meeting all the requirements of the British market reinforces warnings of growing attention by Canadian electrical manufacturers to the British market, something which has been increasingly apparent in recent months.

Meteor

This week's quick summary of electrical news faces advertisement page 16

Achieving Mach 5 test flow

SERVO CONTROL SYSTEM FOR R.A.E. WIND TUNNEL

by E. P. von Bergen, M.A.*

IN our 6 April issue we described at some length the new 4 ft by 3 ft high supersonic speed wind tunnel at the Royal Aircraft Establishment, Bedford, which was recently officially opened by the Minister of Aviation, the Rt Hon Peter Thorneycroft, M.P. The wind tunnel is at present operating with a fixed nozzle, which will be replaced at a later date by a servo-controlled flexible plate nozzle. We here describe in detail the operation of the servo systems for the flexible plate nozzle, and the servo systems, already in operation, which are used to control the supersonic diffuser throat and attitude of the model.

Flexible Plate Nozzle Servos

The desired air speed is produced by causing the air to pass through an aerodynamically shaped nozzle formed by flexible curved top and bottom plates suspended between parallel fixed side walls. The narrowest part of the nozzle is called the throat, the gap here being variable from 17 in., for a speed of Mach 2·5, down to 1·5 in. for Mach 5. It is produced by two shaped throat blocks to which the upstream ends of the flexible plates are fixed. At the downstream end the plates run parallel to form a region of fixed cross-section, where the model is mounted. Each throat block carries one end of a main beam; the other end is supported by swinging links from the bridle structure, a fixed support straddling the tunnel at the point where the model is situated. The flexible plates are supported by corresponding main beams through 17 pairs of recirculating-ball screwjacks, rated for a thrust of 10,000 lb. The jacks are servo-controlled and enable the flexible plates to be set precisely to the correct contour for the Mach number required.

It will be appreciated that the jacks must move in a co-ordinated manner to avoid any possibility of excessive local curvature and consequent undue stress in the plate. These co-ordinated movements are provided by the nozzle controller. This comprises a heavy cast base carrying a table which can run lengthways on rollers. Bolted to the table are four rows of six cams and two rows of seven cams, each cam being individually shaped, aligned parallel with the direction of movement of the table (Fig. 1).

Heavy portal frames, bolted and dowelled to the machine base, carry a corresponding array of cam-gauges. Each gauge incorporates a cam follower, moving vertically in recirculating-ball slides. The follower movement is transmitted, via a high-precision rack and gear train, to the rotor of a magslip coincidence transmitter mounted at the top of the cam-gauge. Each magslip is the input element of a servo system controlling one pair of jacks; its rotation is referenced to that of a second magslip connected, through another precision rack and gear train, to the transverse member to which the pair of jacks is attached. By cutting the cam profiles to the correct shapes, a movement of the table will cause all jacks to move in the required relationship to one another.

* The author is on the staff of the Hirst Research Centre of The General Electric Company Limited, at Wembley, England.

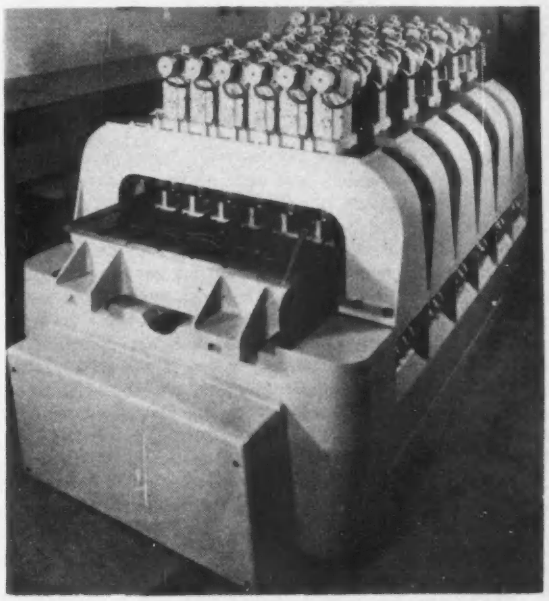


Fig. 1. The Mach 5 nozzle controller showing the table, test cams and cam-gauges

The jacks must position the flexible plates to within an accuracy of about 0·001 in. at any part of the 1 in. maximum range of travel and the maximum electrical error of any single jacking servo system must be less than half of this. The system will correct any misalignment between cam-gauge magslip and jack magslip exceeding the equivalent of about 0·0005 in. Remaining inaccuracies are due to various mechanical components, such as gear errors in the cam-gauge. One possible source of error, backlash in the gear trains driving the magslips, has been eliminated by the use of torque motors. These are small, two-phase a.c. induction motors, designed to give the maximum torque when at standstill. They are geared to the magslip rotors and energised so that torque is constantly transmitted through the gear train to the rack pinion and, in the case of the cam-gauge, pressing the follower against the cam.

With this method of simultaneously controlling all plate jacks, the distance of the cam followers from one end of the 8 in. long cams is directly related to the Mach number for which the nozzle is set. This distance, which is the distance moved by the table from a datum position, has, by design, been made equal to the movement of the throat blocks, i.e., to half the throat opening. The servos which set the position of the throat blocks are controlled from magslips geared directly to the recirculating-ball leadscrew which moves the table. This leadscrew is also servo-controlled by the tunnel operator, the controlling magslips for this servo being incorporated in a preselector.

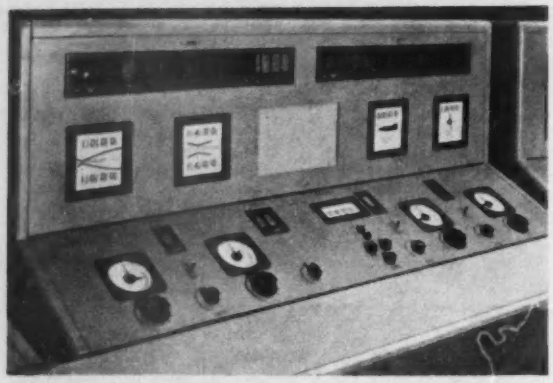


Fig. 2. The control console with mimic indicators, preselectors and associated controls for the servo systems

This device enables the operator to select in advance a throat opening which will achieve the air-flow at the desired Mach number.

The preselector is basically a gearbox, on the front face of which is a dial showing distance of the throat blocks from the tunnel centre line. The pointers are geared to the magslips and to a small d.c. motor controlled directly from a knob on the panel just below the preselector. The operator can drive the preselector in either direction at three speeds, the fastest being for coarse setting and the slowest for final, precise adjustment of position. The servo systems are then energised, moving the throat blocks and plate jacks to reshape the nozzle, at a pre-set rate, for the required air-speed.

Supervisory Instrumentation

To provide a check on the movement of the servos controlled by the preselector, the operator has an indicator giving a pictorial representation of the throat opening. The indication is provided by two swinging bars, curved to represent the throat, each geared to a torque magslip energised by corresponding magslips geared directly to the respective throat blocks.

A digitiser system is also provided to give a direct reading of the distances of the throat blocks from the tunnel centre line on two four-digit indicators in the pictorial indicator casing. The digitiser heads are also directly geared to the throat blocks, being in the same gearboxes as the control magslips, with torque motors to eliminate backlash as in the case of the plate jacks. The digitiser heads each consist of four synchro-transmitters geared together (one synchro for each decimal digit to be displayed) the output voltages from these being suitably transformed, mixed and made to control bi-stable transistor circuits. These, in turn, control decoding relays which drive M-type d.c. motors (12-position stepping motors) in the four-digit indicators. The numerals are displayed on the circumference of light cylindrical drums attached to the motor shafts. Further contacts on the decording relays are used for the data recording system provided for the tunnel. A complete description of the digitiser system (specially developed for this application) is given elsewhere.*

A direct indication of the performance of all the servos is given by an error indicator connected to each servo amplifier. These indicators are mounted on the control desk. The indication consists of a horizontal black bar silhouetted against an illuminated rectangle and each indicator is controlled directly by the signal representing the difference in position between the control magslips of the associated servo. Thus, when all the servos come to rest accurately in the desired position, the bars of all the indicators lie in the centre of the window. A failure of any servo to align itself properly is shown by a displacement upwards or downwards of the bar.

Supersonic Diffuser and Model Attitude Servos

After passing the model, air flow is retarded and brought to subsonic speed again by the supersonic diffuser. The side walls of this each comprise two movable plates, one hinged to a fixed support at the upstream end, the other hinged to a sliding support downstream, and joined to each other at a common hinge. They can be moved inwards to form a constriction by means of a 3·5 in. diameter recirculating-ball screwjack on either side, acting near the common hinge of the plates. These jacks are servo-controlled and the distance of the common hinge from the tunnel centre line may be varied from 8 in. to 17 in. and must be set to an accuracy of ±0·02 in. Since the required hinge distance is related to the Mach number, the supersonic diffuser jack servos are also controlled from the nozzle controller by two cams and cam-gauges. A further provision for the supersonic diffuser servos is a control by which they can be switched from the nozzle controller to a second preselector on the control desk, so bringing them under direct control of the operator.

Two other important servos are those controlling the attitude of the model. This is mounted on a tapered cylindrical "sting" which is carried on a quadrant, a flat member supported vertically in a removable section of the

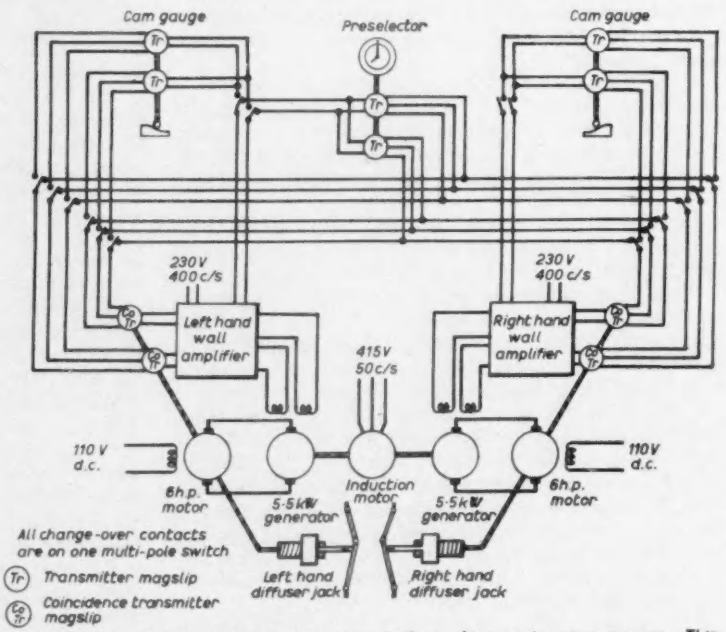


Fig. 3. Schematic layout of the interconnections in the working section servo systems. This deals with the supersonic diffuser jack control

* T. Roberts: *Transactions of the Society of Instrument Technology*, Vol. 13, No. 1, March, 1961.

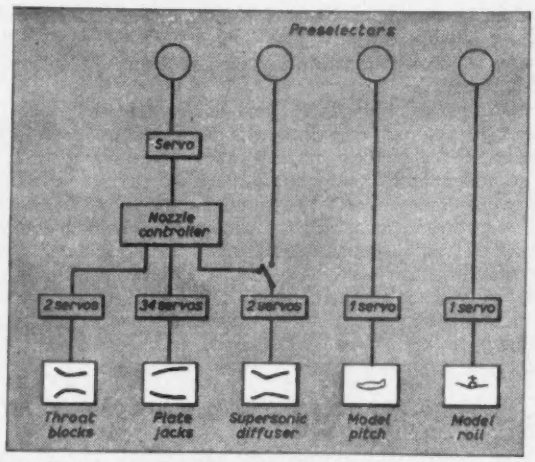


Fig. 4 (above). Line diagram of the controls to the five groups of servos on the control console

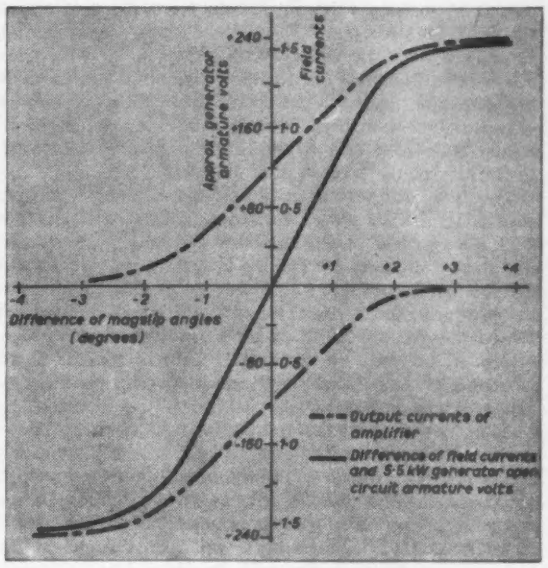


Fig. 5. Graph showing a typical servo amplifier characteristic indicating relationship between generator field current and magslip misalignment angle for steady state condition

tunnel. The "sting" can rotate through 360° to roll the model, the movement being controllable within an accuracy of ±0·1°. The quadrant can move vertically in an arc of a circle with its centre at the centre of the model, inclining the model to the airstream, this movement being controllable to an accuracy of ±0·05°. Both movements are set by preselectors on the control desk.

The supersonic diffuser setting and model attitude are displayed to the operator by mimic indicators and digitisers in a similar manner to the throat block movements.

Details of Servo Systems

The servos and their inter-relationships may be represented by a block diagram (Fig. 4). All are basically of the same pattern apart from variation due to the different sizes of the driving motors and special requirements for certain servos, such as pre-set speed control. Each servo consists of magslips controlling a d.c. generator through an amplifier, the generator, in turn, feeding a d.c. motor. Three sizes of motor are servo-controlled; the flexible plate jacks and nozzle controller and corrector are driven by ¼ h.p. motors, pitch and roll movements of the model by 1 h.p. motors, and the supersonic diffuser and throat blocks by 6 h.p. motors. All are reversible d.c. motors, separately excited at 110 V, and with class H insulation, since heat developed in the tunnel under some conditions of operation will be conducted through the structure to the motors.

In considering the servos in greater detail, it is convenient to describe the supersonic diffuser servo system as a typical example (Fig. 3). As stated earlier, the diffuser may be set automatically to correspond to any given Mach number or it may be controlled directly by the tunnel operator using the diffuser preselector. The chosen setting for the walls is shown by two pointers. The small inner pointer shows inches and tenths and the outer pointer, making one revolution for each tenth of an inch, indicates hundredths of an inch, providing a high degree of resolution. The range of servo-controlled movement of each wall is from 8 in. to 17 in., and the combination of this range and necessity for setting accuracy makes the use of coarse and fine magslips essential. The two transmitter magslips in the preselector are geared in a 10:1 ratio, so that one makes 4·5 revolutions for the full range of pointer movement while the other makes 0·45 of a revolution. The magslips are connected to corresponding pairs of magslips, two for each wall and geared in the same ratios, which are rotated by the movement of the diffuser walls through precision, minimum-backlash gearing driven by racks mounted on ball-slides. The magslips form coarse and fine error signal chains for both walls using common transmitters. Alternatively, to control the diffuser from the nozzle controller, the magslips linked to the walls may be connected by a multipole changeover switch to the cam-gauge magslips, the two gauges at the back left of the controller in Fig. 1, each having a coarse and a fine transmitter magslip, suitably geared, so that in this case there are separate pairs of coarse and fine chains for the two walls (see also Fig. 3).

As usual for magslip systems, the angular settings of the magslips are such that, when the walls are at the dimension set on the preselector, or correspond to the height of the cams as the case may be, output voltages from all four chains are zero. When the preselector or nozzle controller is moved, signal voltages, proportional to the angles through which the preselector magslip rotors are turned, are generated in the chains. For each wall the signals are amplified. If the preselector or cam-gauge movement corresponds to less than about 100° rotation of the fine magslip, the amplified error signal from the fine chain provides the control; if the movement is greater, a relay transfers control to the coarse chain, until such time as the misalignment has fallen to 100° or less.

The amplifier is double-sided, each side controlling a field winding of a double field, 5·5 kW d.c. generator. With no input signal to the amplifier, each field winding has a current of 0·75 A flowing in it, producing magnetic fields in opposition, and no voltage is generated. When an error signal is fed to the amplifier the current increases in one field winding and decreases in the other. The net flux, which is nearly proportional to the magnitude of the signal up to the saturation level of 1·5° angular misalignment of the magslip chain, is used to drive the motor in the required direction. Flux direction depends on whether the error signal is in or out of phase with supply to the magslip transmitter from a transformer on the amplifier chassis. For zero error signal, the two sides of the amplifier are maintained at half maximum

output by biasing voltages derived from the same transformer. The error signal voltage is added to one bias and subtracted from the other, according to its relative phase. The resultant signals are rectified and amplified to excite the generator fields, as described above. The relationship between generator field currents and magslip angle for steady state condition is shown in Fig. 5, in which the generator voltage level is also indicated.

The plate jack servos are simplest, using only one magslip chain. The servo amplifiers feed the fields of 0·28 kW generators. In their normal mode of working the plate contour is determined by the cams. Any modifications to the contour, which may be needed for different air pressures, etc., would mean cutting new cams. This has been overcome by providing a follow-through magslip, connected between the transmitter magslip geared to the jack and the coincidence transmitter magslip on the cam-gauge. These follow-through magslips are operated by a second set of cam-gauges, mounted on a machine known as the corrector, which is rather like the nozzle controller, and serves to provide a co-ordinated set of corrections for modifying the plate profile to match different tunnel conditions. The cams on the movable table of the corrector consist of inclined bars which are hinged at one end, so that their slopes may be set to predetermined angles. With the corrector table at one extreme of its travel, the cam followers are in line with the hinges of the bars, and the follow-through magslips are in their datum, or zero, positions. They can then be switched into or out of circuit as required. When corrections are required, the bars are set to the required slopes, the magslips switched into circuit and the corrector table moved to the other end of its travel. In this way, all the corrections are set simultaneously and smoothly: their magnitudes are shown by dial indicators on the observation room panel.

The model pitching and rolling servos, like the diffuser, have coarse and fine magslip chains, but use 1·1 kW generators. An additional feature of these two servos is the requirement for steady traverse under precise speed control, calling for a continuous range of pre-set speed from the full speed of 1°/sec of pitching or 2·5°/sec of rolling, down to one-tenth. In addition, these servos are preferably "dead-beat," unlike those already mentioned, where a limited transient overshoot on initial alignment is permissible.

In the case of the throat and nozzle controller servos, the high accuracy combined with the range of movement make the use of three magslip chains necessary, the magslips being geared in the ratios 100:10:1. The coarse chain magslips make 0·4 of a revolution for the full 8 in. travel of each throat block and the controller table. The throat block servos do not require to be dead-beat, but the nozzle controller servo does and is speed-controlled in a similar manner to the model attitude servos (full speed 4 in./min), with acceleration and retardation of the table limited to permit the jack servos to respond without excessive following errors.

Servo Amplifier Design

The amplifiers use transistors throughout and include semiconductor diodes. The d.c. amplification is provided by three or four emitter-coupled stages (according to the servo), the careful design of which has resulted in a performance which is independent of variations in transistor characteristics, within normal production tolerances, and which is also little affected by changes of ambient temperature in the room where the equipment has been installed. The basic amplifier, used for all plate jack servos, has three stages of d.c. amplification on each side, using a 24 V d.c. supply. Other servos use the basic amplifier coupled to a "modifying unit," individual to the particular servo. The latter contains all other special circuits needed, such as the coarse/fine magslip chain switching, speed control and special feedback circuits. In the case of the model attitude, supersonic diffuser and throat block servos, the modifying unit also includes a fourth d.c. amplifying stage necessary for the fields of the bigger generators. This stage is supplied at 35 V to 60 V, depending on the servo, and incorporates two power transistors working in parallel to feed each field. Each transistor, with its special mounting arrangement, is capable of dissipating 11 W at maximum room temperature. The maximum power fed into a 5·5 kW generator field by a pair of transistors is 50 W.

In any servo system the question of stability is an important consideration. A major factor in the stability or otherwise of a system is the inertia of the load, including the drive. In the case of all servos described in this article, the large reduction ratios in the drive gearing make the inertia of the load negligible compared with that of the motor itself. A transient velocity feedback is used for some servos, e.g., plate jacks and diffuser, derived from the output voltage of the generator; that is, a feedback current is fed to the amplifier only when the generator voltage is varying.

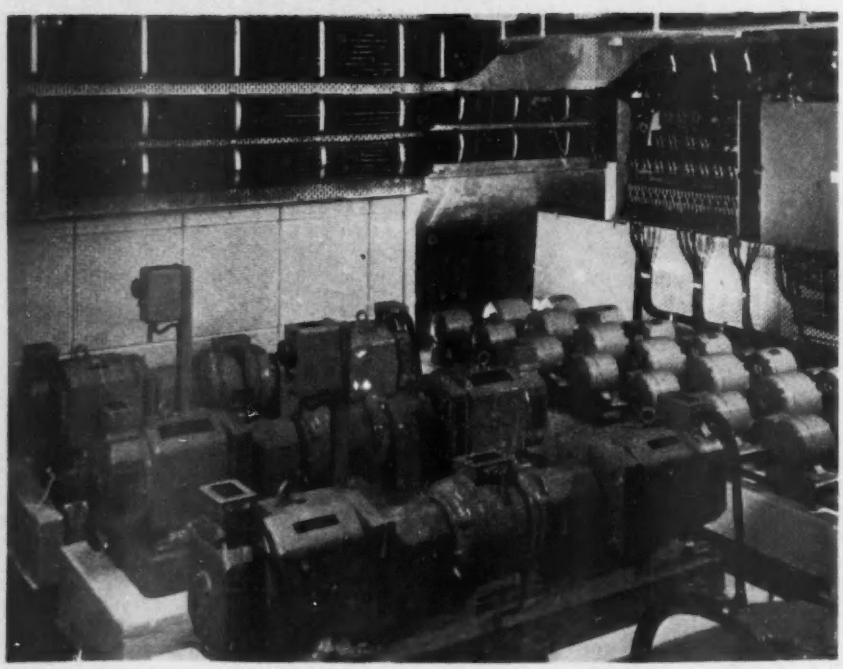


Fig. 6. Part of the m.g. room showing three of the 1·1 kW generator sets and plate jack sets

As already stated, the supersonic diffuser walls are required to be positioned to an accuracy of ±0·02 in. in a travel of 9 in.; so, to allow for manufacturing tolerances, the servos are designed to produce the required output torque for an error of 0·005 in. This result has been achieved without difficulty. The throat block servos, though similar to the diffuser servos, are required to operate to ten times greater accuracy, with a correspondingly greater problem in achieving stability. The feedbacks are stronger and more complex, since diminution of performance in any way must be avoided. The feedback signals are derived from tachometer generators geared to the driving motors. The nozzle controller and pitching and rolling movement servos also use tachometer generators, principally because of the speed control requirement.

Motor Generator Sets

The generators are housed in a room provided for the purpose at one side of the wind tunnel building. Since the various servos fall readily into pairs, the corresponding pairs of generators have a common driving motor (Fig. 6). The two pairs of 5·5 kW generators for the supersonic diffuser and throat block servos are driven by 18 h.p. 3-phase induction motors. A third set, of identical design, has been provided as a standby and may quickly be connected into circuit in place of either of the other sets by changeover links. The two 1·1 kW generators of the pitch and roll servos are driven by a 3·5 h.p. induction motor; a second, similar set, provides power for the movement of an airstream calibration probe, which can be inserted into the tunnel in place of the model support section. A third set forms a standby for either of these, and a fourth set is installed for use with a model support section in the rigging bay to which it can be connected via a jumper from sockets on junction boxes. This is controlled from a mobile desk through its own servo amplifiers so that, when one model is under test in the tunnel, another model on a second model support section can be prepared in the rigging bay. The pairs of plate jack generators are driven by 1 h.p. motors laid out in a row below the control platform. In their case it has not been felt necessary to provide linking arrangements for standby sets. As they are comparatively easy to handle, a defective set would be lifted out bodily and replaced by a spare set.

The special 230 V, 400 c/s single-phase supply, used by the servo amplifiers and digitisers, and the 110 V d.c., used for the motor fields and a considerable part of the control and interlocking circuits, are derived from motor-generator sets mounted beside the servo generators. The 400 c/s supply is provided by a 30 kVA alternator coupled to a 27 h.p. induction motor and is controlled by an automatic voltage regulator which holds the voltage to ±2·5% for variations of from one-quarter to three-quarters of full load. A 12·5 kW generator driven by a 20 h.p. induction motor provides the 110 V d.c. supply. Both these sets also have duplicate standby sets, with link boards to facilitate the changeover of connections.

Interlocking and Protection

All motor generator sets are direct-to-line started through contactors, with the usual h.r.c. fuse and overload protection. Electrical interlocks prevent starting on load and ensure that starting operations are carried out in correct sequence. As a first step, the amplifiers are connected to the 400 c/s supply, but the connection is not completed unless cooling fans installed in the amplifier cubicles are running. Relay circuits in each amplifier detect absence of internally derived supplies and also whether or not the connections to the amplifier are properly plugged in. The servo motor fields are then switched on; each motor has a field failure relay—the contacts on all relays being connected in series. Closing of all field failure relays energises the contactors controlling the motors of the m.g. sets, the generator armature circuits of which are open.

At this point, fault detection circuits, which lock in the fault condition after the occurrence of a fault or interruption of supply, must be reset. These include plug interlock circuits, which check that all servo components such as magslips are properly plugged in, and limit switch circuits, which ensure that no servo-driven member has attempted to overrun its mechanical limits. Only when all related fault circuits have been reset, amplifiers are working properly and the m.g. set for the servo is running, can the servo finally be energised by closing the common armature circuit of the generator and motor. Here also overload protection is provided by a relay with contacts in the armature-loop contactor circuit.

The relays and contactors are all housed in cubicles on the control platform in the motor-generator room and signal lamps on one of the cubicle panels show the state of all fault circuits and m.g. set motor contactors. The state of circuit excitation can therefore be seen at a glance and any fault quickly located.

The working section leg of the tunnel was built by The General Electric Company Limited, under contract to the Ministry of Works acting on behalf of the Ministry of Aviation; the development of the servos was carried out at the Hirst Research Centre of the Company.

The author is indebted to the Director of the Hirst Research Centre, to the Chief Engineer, Ministry of Works, and to the Director, Royal Aircraft Establishment, Ministry of Aviation, for permission to publish this article.

Axial Surface Condensers

AN order worth £1½ million is being placed by the CEGB with Associated Electrical Industries Ltd. for four surface condensers for use in association with four 500 MW steam turbines in one of the new Midlands power stations. The units ordered are of novel design.

Traditionally, condensers have always been placed transversely in the turbine foundations, an arrangement which makes it impossible to provide turbines with continuous supporting walls. However, the rapid increase in the unit size of power generating plant has made the provision of continuous support more important. Also, the increasing number of exhaust flows in these large machines has necessitated the use of two and even three condenser shells. With transversely arranged units the problem of turbine support has therefore become more and more difficult.

The new AEI condensing units have been designed with the aim of overcoming this problem. Single-shell units, which will be arranged parallel to the turbine axis and housed within the foundation-block supporting walls, have been developed. This arrangement has made it necessary to employ a single water-pass in the condenser tubes and, while this has the advantage of making the condensers lighter and more compact, it also presents technical problems that have had to be overcome.

Appreciable saving in cooling water requirements are claimed for the design adopted. Each condenser will have 300,000 sq ft of heat transfer surface, and cooling water will be circulated at the rate of 200,000 g.p.m.

Extruding Electrical Sections

THOMAS BOLTON INSTALL MECHANISED 1,700 TON EXTRUSION PRESS

AS users of large quantities of extruded non-ferrous sections, the electrical industry has a special interest in the new extrusion press which was officially opened by Sir William McFadzean last week at the works of Thomas Bolton and Sons. This interest extends also to the high degree of mechanisation used in the operation of the press and the heavy electrical loading necessary.

Raw material comes to the press in the form of billets of 6 in. or 8 in. nominal diameter. These have to be cut to a length from 10 in. to 27 in. depending on the type of section to be extruded. From the hopper of cut billets, control is automatic. A conveyor feeds them to one of the three Loewy mains frequency induction heaters, which together are capable of heating six tons of copper per hour to 850°C. To take account of the differing billet size, each heater has alternative sets of coils, each provided with secondary tappings at ¼ in. intervals, to cater for different billet lengths, a heavy current selector switch being used for selection. Each heater has a loading of 500 kVA and correct temperature is maintained by Honeywell Brown control. Three 1,000 kVAr BICC capacitors, each capable of adjustment by a five-step switch, provide for power factor correction.

Essential control of the whole process is by two push buttons only, situated on the control panel beside the press. These initiate the two stages in the sequence of operations, all detail control is subsequently automatic. As a billet in a heater reaches the preset temperature, a lamp lights on the control panel. The operator can then start the first sequence. Air cylinders withdraw the hot billet from the heater and allow it to roll on to a fast-moving conveyor which carries it to the discharge point. There the billet finally rolls down to the extrusion position, with a pressure disc behind it. At the same time a cold billet is waiting to recharge automatically the heater. At the operator's discretion the second button can be pressed to start the extrusion cycle proper. The press then automatically carries through all stages of extrusion, including cutting off and ejecting the tail end of the billet.

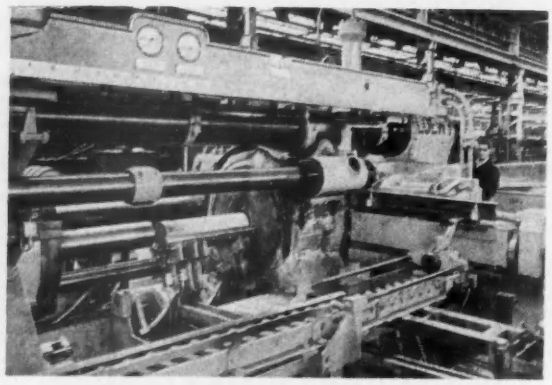


Fig. 2. A hot billet in position for extrusion

The extrusion press itself, 1,700 ton oil-hydraulic operated, is a Loewy horizontal three column design with several special features. To prevent unnecessary delay in operation, a rotating die-holder enables the die in use to be quickly changed and brought to an outer position for dressing. So simple is the procedure that it is the practice to examine the die after only a limited run. Nimonic alloy has proved to be the best material for dies and these are cut in the tool room by spark erosion technique.

The size of the press makes heavy power demands. Ten high-speed oil pumps provide the hydraulic pressure, group driven by two 250 h.p. 3,300 V Laurence Scott motors mounted on a platform above the press.

Alternative arrangements are available for handling the extruded material. Sections required in straight lengths are fed on to a run-out table, having variable speed control. Subsequently a slow cross-transfer conveyor carries the lengths to the other side of the table, where a shear cuts the section into suitable lengths. Fig. 1 shows the press set for the reeling of small rod or strip. Twin variable speed coilers have been installed, with a special torque limiting device for producing pancake coils of strip, wound to a controlled tightness.

To provide for the heavy loads required by this press, a special sub-station has been installed, equipped with English Electric gear. Three of the four 1,000 kVA transformers step down the 11 kV supply to 3·3 kV for the main pump motors and induction heaters. The fourth transformer provides a 415 V supply to auxiliary motors and equipment.

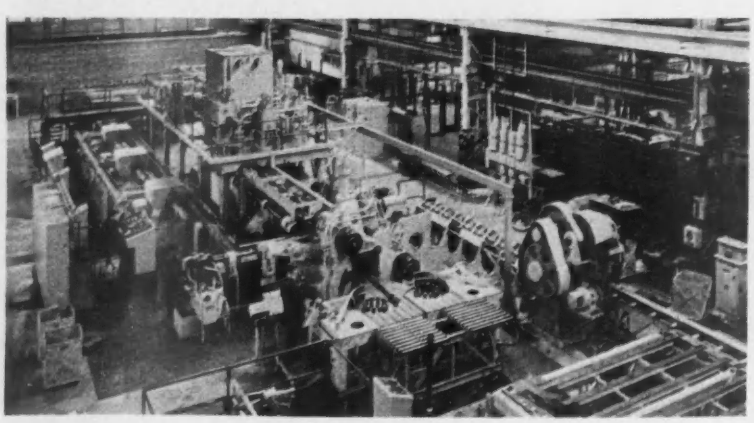


Fig. 1. Discharge end of press with boilers in position. Run-out tables on right

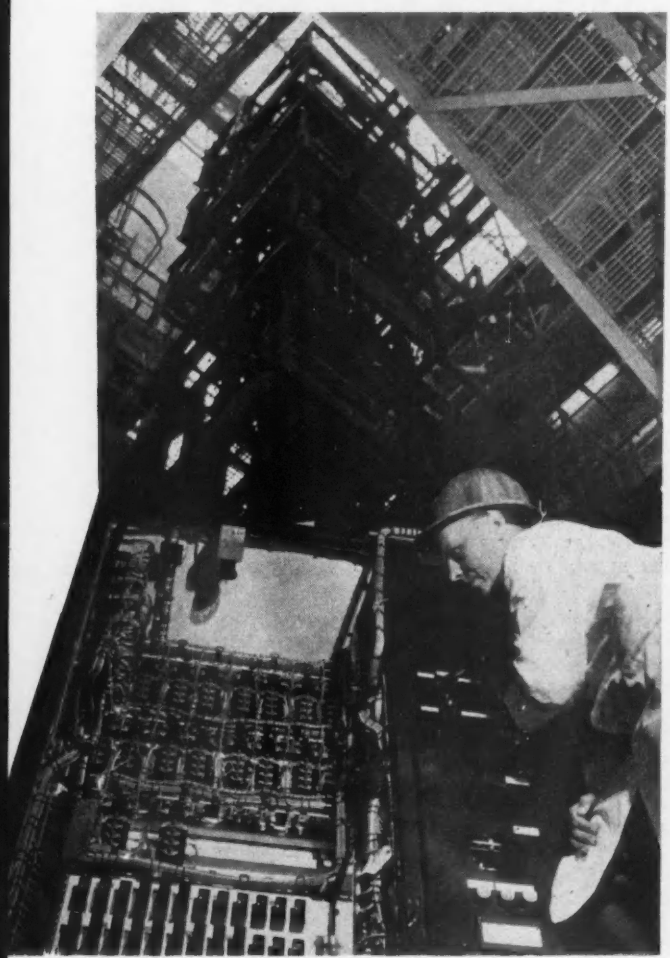
Testing nuclear station components

E.E./B.W./T.W. GROUP'S FACILITIES IN OPERATION

LESS than two years after its official opening—briefly reported here in August, 1959—the English Electric/Babcock and Wilcox/Taylor Woodrow Atomic Power Group's testing installations at Whetstone and Rugby are now fully engaged on checking the operation of refuelling and gas-circulating equipment, with associated controls and protective gear, for Hinkley Point.

With no long-term practical experience of nuclear generation to go on, it has to be accepted that much of the equipment designed for nuclear stations now under construction is, in the broadest sense, experimental. The high capital cost of the stations makes it essential that, to keep generating costs competitive, a high load factor must be attained with the minimum of lost generating time for maintenance or repair of associated equipment. This, in turn, necessitates a high standard of reliability in operation and good wearing qualities in all components, particularly those associated with the charge-discharge machinery and gas-circulating plant. The problem facing designers and manufacturers is how best to ensure such qualities by laboratory test methods.

The Atomic Power Group's answer has been to set up, in the Whetstone and Rugby works of the English Electric Co., a member of the consortium, extensive testing facilities which include full-scale facsimile sections of nuclear furnaces in which all conditions, excepting only that of atomic radiation, can be reproduced and the cycle of charge-discharge carried out exactly as in an operational station. Such an installation is, naturally, a costly business and, as Mr E. M. Price, General Manager of the Atomic Power Division of the company, explained at a technical Press conference last week, the sum involved —about £3 million—is not recoverable from the profits of the first, or even the second order. Rather it is to be looked upon as an investment in experience and an insurance against extensive modifications and delays in getting the station into full service. Moreover, the cash has been provided jointly by the members and not from the public pocket, which should indicate the confidence they have in themselves and the future of nuclear generation.



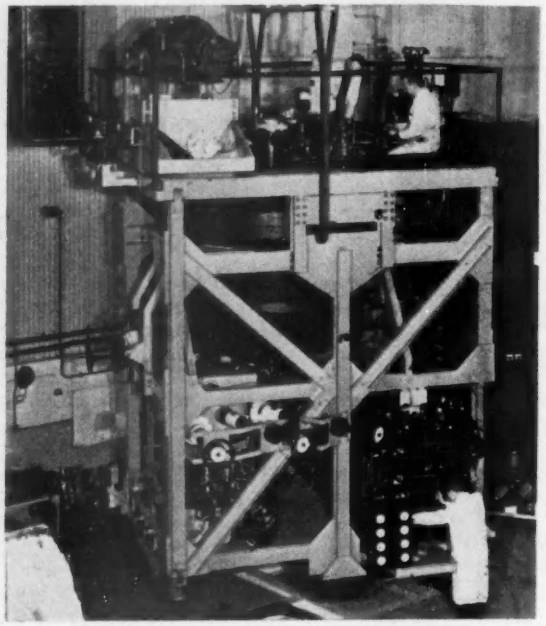
Engineer adjusting equipment in the contactor cubicle of the hole-preparation machine for Hinkley Point in the 70 ft deep shaft at Rugby. Here the test rig simulates actual full-scale conditions, apart from radioactivity, experienced in the atomic furnace

Testing Charge Machinery

The furnace simulator at Whetstone is for testing the charge-discharge unit and is installed in a shaft 90 ft deep in a building with 50 ft headroom. The main simulator is a pressure vessel containing a group of 36 fuel channels through which carbon-dioxide can be circulated at the full working pressure of 200 lb/sq in. and temperature of 400°C, the latter being achieved by an electrically heated and lagged jacket around one leg of the gas-circulatory system. Access to the different levels from the main floor is by ladder and lift and the shaft contains a second, shorter test installation representing the upper section of a reactor to charge-pan level. This again contains 36 fuel channels, but only one fuel element deep, and also operates under reactor conditions of temperature and pressure. It enables testing to be carried out on the charge-chute and charge-machine apart from a fuelling cycle and increases the capacity of the testing plant.

Access to the vessels from the test room floor is via the normal type of entry, already prepared by a charge-hole preparation machine, the complete charge-discharge machine being lifted, without its shielding, into place by the test-room crane in a temporary framework. Other rigs can be set up to test the charge-chute assembly, control-rod functioning, fuel-element-can supports and associated thermo-couples and cushioning devices on the end of a string of elements to reduce hazards of damage through inadvertent dropping to the bottom of the fuel channels.

At Rugby a similar shaft, 70 ft deep, provides the



Testing a reactor fuelling machine for Hinkley Point at the Whetstone works of English Electric. Below the floor is a 90 ft shaft accommodating pressure vessels with facsimile groups of 36 fuel channels

means of testing charge-hole preparation machines with their associated control gear on facsimile furnace sections, pressurised and heated, to ensure that they will function efficiently and safely when removing the sealing plugs and control rods and lowering the charging chute into the reactor, all without loss of gas or pressure in the reactor. The operations are controlled in automatic sequences from a console as in a normal installation, telephonic communication between the console and observation points enabling the correct functioning of all seals, locks and electrical equipment to be checked step by step.

Circulator Test Bed

Testing of the single-stage axial blowers for the gas circuits is also catered for in another facsimile rig at Rugby, the axial blower, in its casing, being inserted in a closed gas circuit and driven by a 700 h.p. electric motor. In service it is driven by an induction motor coupled to a 33 MW turbo-alternator which is run at varying speeds as required by controlling the governor setting of the turbine. To maintain circulation with the alternator out of commission, a pony motor on the same blower shaft will be fed from a stand-by diesel generator. The Hinkley Point blower motors are rated at 7,000 h.p. and will handle close on one ton of CO_2 at 200 lb/sq in., 178°C per second.

Also on test at the time of the visit was the first of the steam turbines for Hinkley Point. The main units are of the impulse-reaction type rated at 87 MW with dual cycle steam flows at 615 lb/sq in. 680°F h.p. and 155 lb/sq in., 655°F l.p. the two flows meeting in a mixing belt half way down the h.p. cylinder. The variable frequency auxiliary sets are designed for economic ratings of 28 MW using h.p. steam only.

Other interesting points visited included the highly automated graphite machine shop, where the 308,000 graphite components for the reactor are machined to close limits under clean conditions, and also the Saturn computer, believed to be the largest analogue computer in Europe with a capacity of 1,512 computing amplifier and 192 servo-multipliers. This has been engaged on a close study of control problems and highly complicated mathematical analyses of three-dimensional stresses in reactors.

Lighting the Inner Ring

THE £23 million Birmingham Inner Ring Road, the construction of which is now well under way and scheduled for completion in 1969, was the subject of an interesting paper* presented by the City Engineer and Surveyor and President of the ICE, Sir Herbert J. B. Manzoni, C.B.O., in London on 25 April. Though the major part of the paper and discussion was, naturally, concerned with civil engineering problems, the aspect of illumination by night was also featured.

The primary function of the road is to route through-traffic around the centre of the town with as little interference from pedestrian and cross-vehicular traffic as possible. It would therefore seem reasonable to adopt a level of illumination for traffic routes in accordance with C.P.1004, which gives a value of 2,600-7,000 lm/100 lin ft. In view of the special character and importance of the thoroughfare, and to encourage the development of fine quality frontages along the route, it was decided to adopt good colour-rendering illumination of level comparable to that in the city's main shopping centres, about 30,000 lm/100 lin ft.

As events proved, the achievement of this level raised problems more concerned with the support methods than in the design of lanterns. Though the ideal method favoured support from building frontages, this raised difficulties in that it imposed limitations on site developers, tended to limit elevational treatment of new buildings and would have complicated the lighting plan, since dates for completion of the buildings were uncertain.

Of the remaining possibilities, the one chosen was the use of slender steel columns at the outer kerbs, spaced about 100 ft apart, with 4 ft 6 in. dia bowl lanterns enclosing three 400 W colour-corrected MBF/U mercury fluorescent lamps behind a dished "Perspex" translucent bowl under a spun aluminium dome. The fittings, made by the GEC, were described in these pages on 22 January, 1959 (page 128). To have achieved the same level of illumination from fluorescent tubes would have necessitated an unduly large fitting with about 20 5 ft tubes.

To avoid an unsightly appearance on flyovers and underpasses, a system of horizontal strip lighting, comprising a continuous row of fittings mounted 3 ft above road level and built into the parapet wall or forming part of the handrail, has been proposed. Each houses a 5 ft 80 W fluorescent tube with louvres, to give a 20° lateral cut-off, and a parabolic reflector with adjustment permitting no part of the tube or reflector to be visible by drivers of even the smallest of vehicles. A test installation has received favourable comments from road users.

Pedestrian subways around the route, which also serve as shopping areas, have received careful consideration. The illumination here is of the order of 10 lm/sq ft, excluding any contribution from shop or showcase windows, from shallow fluorescent fittings in the ceilings.

* Paper 6.489, "The Inner Ring Road, Birmingham," Institution of Civil Engineers.

NOTES ON WIRING

BY MEGOHM

MY recent remarks about lighting in hospitals appear to have interested quite a number of people and in particular manufacturers of lighting fittings. It now seems that others in that field have been giving much thought to this rather delicate problem. I say "delicate problem," not from a design angle but from the aspect of policy.

It seems that those people who have the final say in such matters, that is from the hospital side, still prefer a "sphere" type fitting and, as far as they are concerned, that type of fitting is installed. The patient has other ideas. Few things can be more detrimental to a sick person than having to look at a ball of fire hanging from the ceiling. I am fortunate, for I have never been in such a situation, but I do know one lighting engineer who has, and he has informed me that he was directly involved in the designing of hospital lighting fittings.

Of course, the matter does not end in the provision of good fittings. I feel that too many of the people involved in the planning of lighting installations are inclined to overlook the final desired effect. This may sound a very sweeping statement, so let me explain it further. The normal procedure appears to be that the positions of lighting points are marked on the plans and installed accordingly, then, towards the end of the work, the lighting fitting manufacturer is called in and asked to supply a fitting to do the work. Quite often the result leaves much to be desired and leads to unfavourable criticism *of the lighting fitting*. Once such criticism is passed it very often sticks and the manufacturer's name is remembered only for that reason. We in this industry should think the whole matter over and study the lighting requirements in relation to the practical use of the area to be lit rather than just lighting it. This does not only apply in public buildings and factories, for the ordinary house needs attention too.

Addition to Switch Range

A useful addition to the range of switches referred to as the gridswitch range has been achieved by a modification. The push-button for this range has now been fitted with a third terminal, so that it may be wired as a "push-to-make" or "push-to-break" or both. One terminal is common and the other two are appropriately marked for the purpose selected. The push-buttons are now also available in red and green as well as the original brown or ivory. They are suitable for fitting on any of the one- to four-gang grids for flush or surface work. The fixing centres of this push-button switch are identical to that of all the other switches in the range.

Earth-loop Testing

No doubt readers noted letters which appeared in the Readers' Views column in the issue dated 27 April, 1961, regarding earth-loop testing equipment. This correspondence arose because of a mention by me of this equipment and since then I have been bombarded with queries and opinions. This matter of earthing and the testing of earthing positions is a subject which can be argued about from now until "doomsday." There are many traps in this earthing business which one can easily fall into, and books have been, and will be, written about it by knowledgeable engineers and others. Earthing of installations is regarded as being a safety measure and as such should receive first-class consideration and application. Sad to say, this is not the case and, consequently, the installation and/or user suffers.

I feel that the Chief Technical Officer of the NICEIC puts his finger right on to the answer to many problems when he states that it is important for installations to be tested periodically. Everybody in the electrical industry agrees, when a fatal electrical accident occurs the coroner agrees, but there is no evidence at the moment that these thoughts will ever become law. This, I feel, is where the NICEIC comes into the limelight, and rightly so, too. Their methods of testing should be copied by all concerned and their recommendations and/or condemnations taken to heart by those subjected to their inspections. No doubt we shall hear more about this subject and the more we hear, discuss and argue about it *in the open*, the better it will be for us all.

Low-voltage Outlets

The demand for low-voltage sources of power are increasing and I am pleased to note this trend. One manufacturer offers a range of transformers for such sources which is economical and universal as far as mounting is concerned. It is always a bit of a problem to determine just the correct arrangement for low-voltage outlets. This range offers wall mounting, floor mounting or portable types suitable for indoors, with special arrangements for outdoor use. The sizes are 50 VA, 250 VA and 900 VA and they can be fitted with a 5 A, 15 A or 30 A socket, and in the case of the 900 VA model two outputs are possible. The voltage ranges are 55-0-55 and 25-0-25. The units are housed in robust sheet steel cases and finished hammer grey. The portable model is fitted, by request, with carrying straps. Non-standard windings can be supplied if required.

These units, in my opinion, are neat and well made and have proved themselves to me in situations where the use of low-voltage tools and portable lighting was desirable yet not welcomed. Certain people seem to be prejudiced about l.v. apparatus, although I cannot understand why. This type of apparatus is surely much safer than the normal type when one has to crawl over or clamber about large water pipes, etc. I know that many authorities are using l.v. handlamps in boiler houses but still insist on a normal voltage socket also, to serve portable tools such as drills, etc. This, to me at any rate, ranks as one of those rather stupid official rulings that we meet regularly, although questions of weight and voltage drop can introduce difficulties about using low voltage.

Engineers who do use l.v. tools have told me that they are really efficient and if a part of the plant has to have a major job done on it they would sooner remove that part to their workshops where, if they so wish, a standard-voltage tool can be used with probably less risk than actually on the site.

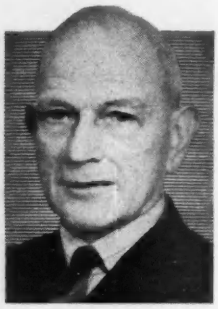
Personalities *in the industry*

Mr T. Coates

Mr F. W. Tomlinson

Mr A. J. Dalton

Mr J. C. Milne



Mr F. W. Gardner

Former deputy chairman of the North Western Electricity Board, **Mr T. Coates,** M.ENG., M.I.E.E., M.I.MECH.E., who became the first general manager of the British Egg Marketing Board at the beginning of this year, has now resigned from that post. Commenting on the decision, Mr C. Harrison, vice-chairman of the Egg Marketing Board, is reported to have said "the job was not quite what Mr Coates thought it was. He was used to working in a nationalised industry, but he found the Egg Board was not quite the same thing." Mr Coates, who is 53, may now return to our industry, in which he had served throughout his career prior to 1961. He was deputy chairman of the North Western Board for five years, following seven years as manager of No. 3 sub-area of the Merseyside and North Wales Electricity Board. Mr Coates hopes to return to the electricity supply industry, we understand.

Sales manager to Lumitron Ltd., **Mr F. Granville** has been appointed to the board of directors.

While retaining his position as managing director of Pyrotenax Ltd., **Mr F. W. Tomlinson,** M.A., F.I.M., M.I.E.E., has been appointed deputy chairman of Murex Ltd. and of Murex Welding Processes Ltd. Mr Tomlinson has been with Pyrotenax since 1938, and was previously production development engineer in the Metals Division of ICI Ltd.

Newly elected president of the Shipley and Baildon Chamber of Trade is **Mr Herbert Binns,** director of the electrical contracting concern Gordon Binns Ltd.

Senior assistant commercial engineer in the Wolverhampton and District sub-area of the Midlands Electricity Board since 1956, **Mr R. L. Evans** has been appointed commercial engineer in the Cardiff and East Central area of the South Wales Electricity Board. The appointment arises because **Mr C. V. Ball,** ASSOCIATE I.E.E., who has held the position for nearly eight years, has suffered a long and severe illness and it is uncertain when he will be able to resume duties within the Board. (*ESH, page 132.) Mr Evans, who is 40 years of age, served an apprenticeship with the Power Centre Co. Ltd., and subsequently held a number of technical appointments with industrial firms in the Midlands before joining the Midlands Electricity Board in 1950 as a first assistant district engineer in the Stone district.

At present Professor of nuclear power at the Imperial College of Science and Technology, London University, **Dr J. M. Kay,** M.A., PH.D., is to join the board of Tube Investments Ltd. as director of research and development from 1 July. It is also announced that the **Rt Hon Lord Clitheroe,** P.C., has become a vice-chairman of the company. **Sir Ben Lockspeiser,** K.C.B., F.R.S., has reached retirement age, and **Sir Francis de Guingand,** K.B.E., C.B., D.S.O., resigned from the board at the end of April to return to South Africa where he will continue to be in charge of TI's interests. Dr Kay has held his present position at the Imperial College since 1956, and was, earlier, chief technical engineer in the UKAEA's Division of Atomic Energy Production at Risley.

Last week-end brought the retirement of **Mr A. J. Dalton,** A.M.I.E.E., from the position of chief commercial engineer to the South Wales Electricity Board, which he had held since April, 1959. His successor is **Mr D. G. Gwyn,** B.SC., A.M.I.E.E., as we reported on 28 July, 1960 (*ESH, page 129). Mr Dalton started his career with the Weymouth Corporation undertaking, and after nearly ten years with the Newcastle upon Tyne Electric Supply Co., left the industry to set up a private practice as an electrical and mechanical engineer; but he returned to the industry in 1934 with the Dorchester Corporation Electricity Department and, two years later, went to South Wales as engineer and manager of the Milford Haven undertaking. In 1948 he was appointed assistant to the South Wales EB's chief commercial engineer (the late Mr J. F. Smith) and was subsequently promoted to deputy chief commercial engineer. Mr Dalton is a member of the EDA Rural Electrification Advisory Committee and has served on many other national and regional bodies concerned with electricity supply.

Managing director of the Electric Construction Co. Ltd., and chairman and managing director of ECC (Moulded Breakers) Ltd., **Mr J. C. Milne,** M.I.E.E., M.AMER.I.E.E., has been elected president of the Wolverhampton Chamber of

Mr D. Q. Holland, treasurer of AEI Ltd., receiving a barometer and binoculars from Lord Chandos, chairman, to mark his 45 years' service with the group

* *Denotes revision to the "Electricity Supply Handbook, 1961."*

Commerce. He has been senior vice-president for the past two years and is chairman of the Wolverhampton District Advisory Committee of the Midland Regional Board for Industry.

Mr F. G. H. Bedford and **Mr F. W. Gardner,** B.A., have expressed a wish to retire from the board of C. A. Parsons and Co. at the annual general meeting of the company on 18 May. Their colleagues have paid tribute to the distinguished service of both Mr Bedford and Mr Gardner, each of whom has spent the whole of his working life with the company and has held the position of chairman. Mr Bedford gained his early training with the company, and became secretary when it was formed into a limited company in 1913. He was appointed joint managing director in 1928, became acting chairman in 1931, and was chairman from 1938 to 1945, since when he has been a director. Mr Gardner took over the responsibilities of chairman following the tragic death of Sir Claude Gibb in January, 1959, and relinquished the office a year ago. He joined Parsons as a student apprentice in 1912 and after war service returned to Heaton works, becoming head of the turbine design staff. In 1938 he was appointed chief engineer to the company and in the following year became a director. From 1944 to July, 1956, he was director and general manager.

General manager of the Electricity Trust of South Australia, **Mr C. R. S. Colyer** is shortly to make a ten-week visit to Britain and the Continent. He is due to arrive in England on 15 July and will be based on London throughout his visit during which he will travel to various works and power plants on the Continent.

Sir Harold Roxbee Cox, D.SC., PH.D., D.I.C., M.I.MECH.E., F.R.AE.S., F.INST.F., has been appointed chairman of the Council for Scientific and Industrial Research for a period of five years from 1 Oct. next, in succession to **Sir Harry Jephcott** who has been chairman of the Council since its formation under the DSIR Act of 1956.

The Minister of Power has reappointed **Alderman E. T. Kinsey-Morgan,** J.P., as chairman of the South Wales Electricity Consultative Council.

Mr N. H. Docker has resigned from the board of Bakelite Ltd. in order to devote more time to his other interests.

The Electrical Research Association announces that the composition of Divisional Committee No. 6—Industrial Applications, is as follows: **Mr H. M. Mathews,** chairman (English Electric Co.), **Mr L. D. Anscombe** (AEI (Rugby) Ltd.), **Mr F. N. Beaumont** (British Petroleum Co.), **Mr J. S. Boyd** (ICI Ltd.), **Dr T. E. Calverley** (English Electric Co.), **Mr W. Casson** (CEGB), **Mr J. O. Knowles** (Metal Industries Ltd.), **Dr D. J. Littler** (CEGB), **Mr D. McDonald** (Bruce Peebles and Co.), **Mr N. F. Marsh** (East Midlands Electricity Board), **Mr H. Pryce-Jones** (South Wales Electricity Board), **Dr B. Schwartz** (Laurence, Scott and Electromotors Ltd.), **Mr F. W. Skelcher** (CEGB), **Mr S. B. Warder** (British Transport Commission) and **Mr C. G. Whibley** (A. Reyrolle and Co. Ltd.). **Dr H. G. Taylor,** director of the ERA, is an *ex officio* member of the committee and the secretary is **Mr C. W. Gaddes.**

Among those to receive honorary degrees at Glasgow University's Commemoration Day on 21 June is **Sir Kenneth Hague,** chairman of Babcock and Wilcox Ltd.

Mr A. C. Cowell has been appointed a director of Electronic Rentals and General Holdings.

Mr J. Griffin, A.M.I.E.E., has been appointed publicity manager to Bruce Peebles and Co. Ltd. following the retirement of **Mr J. S. Baillie.** Mr Griffin was previously with W. H. Allen, Sons and Co. Ltd. for four years, following five years in the Electrical Design Departments of Bruce Peebles and with Crompton Parkinson from 1946 to 1952.

District commercial assistant at Greenock to the South of Scotland Electricity Board, **Mr A. Y. Cameron** was the recipient of a presentation from his colleagues recently to mark his retirement after 41 years' service in the industry. The presentation was made by **Mr T. Wright,** district commercial engineer.

Alcan Industries Ltd. announce that **Mr C. J. Buchanan-Dunlop** has been appointed manager of their Birmingham area sales office in succession to **Mr D. W. Taylor,** who is to take over management of the London area sales office later this year.

Mr F. W. Goodge, a joint assistant managing director of Keith Blackman, is to become managing director of the company on 1 June, in succession to **Mr D. S. Woodley,** who is retiring from that position on 31 May. Mr Woodley will remain chairman and consultant to the company. **Mr C. J. Atkins** will become assistant managing director on 1 June.

Chaplain of the Queen's Chapel of the Savoy, the **Rev Cyril Cresswell** is to resign from that post as from 30 Sept. He is also chaplain to the IEE.

At a presentation held before the Kelvin lecture last week, **Lord Nelson of Stafford** was presented by the President of the Institution of Electrical Engineers with a certificate of honorary membership in recognition of his services both to industry and the Institution. Subsequently, the Faraday medal was awarded to **Dr Julius A. Stratton,** eleventh president of the Massachussetts Institute of Technology.

Presentation of a gold watch by Mrs C. L. Arnold to one of 16 employees of MK Electric Ltd. who had completed 25 years' service with the company. Centre is Mr C. L. Arnold, founder director and general manager

Owing to ill-health, **Mr Cecil A. Mathes** has decided to relinquish the position of chairman and managing director of Bylock Electric Ltd. It is not proposed at this stage to appoint a new permanent chairman, but the board have arranged for **Mr H. J. Latham** and **Mr C. J. Mathes** to become joint managing directors.

Formerly with the Radiation Group, **Mr C. A. Bennett** has joined the sales organisation of Dimplex Ltd.

Formerly senior assistant chief engineer, planning, at headquarters of the North Western Electricity Board, **Mr K. C. Coop,** M.ENG., M.I.E.E., A.M.I.E.E., has now taken up duties as sub-area engineer for No. 1 sub-area of that Board. He succeeds **Mr S. Dodd,** A.M.I.E.E., A.M.C.T., who, as we have already noted, has been promoted to sub-area manager there. Mr Coop's successor in charge of the Planning and Design Section is **Mr E. Oldale,** LL.B., B.SC., A.M.I.E.E., A.M.B.I.M. (*ESH, pages 155 and 156.) Mr Coop, who gained early training with Metropolitan-Vickers Electrical Co., served with the Yorkshire Electric Power Co. from 1932 to 1946, when he became deputy borough electrical engineer and manager at Blackpool. From 1948 to 1957 he was assistant chief engineer (construction) with the North Western Board.

Mr L. Rotherham, M.SC., F.INST.P., F.I.M., member for research, CEGB, has been elected chairman of the Council of the British Electrical and Allied Industries Research Association for the year 1961/62. **Mr S. E. Goodall,** M.SC.(ENG.), M.I.E.E., director of engineering, AEI (Woolwich) Ltd., was elected vice-chairman of the council.

Deputy chief electrical engineer of the Hydro Electric Commission of Tasmania, **Mr R. W. Wadsley** is now in this country on a three months' visit during which he will also study hydro-electric projects on the Continent.

Forty years of the E.R.A.

ANNUAL REPORT REVIEWS RESEARCH PROGRAMMES

THIS week sees publication of the fortieth annual report of the Electrical Research Association, which was incorporated on 22 September, 1920. The report for 1960 records that for its first few years of existence the Association had no laboratories, experimental work being commissioned at the NPL and at various universities. It was largely a manufacturers' association then, only in the third year of its existence did supply companies come in as associate members.

In its 40 years the ERA produced over 2,000 reports, and its research activities have ranged from practical matters of immediate application to fundamental studies.

The year reviewed in the report saw the completion of creep laboratories at Leatherhead and the transfer of office staff to the laboratories site. During the year the Association secured 41 new members, 15 of them from overseas. Its income was over £10,000 up, a rise of 2·2%, while expenditure changed very little.

Research Progress

The report includes a brief survey of progress with research during the year, with pride of place, as usual, given to insulation and dielectrics. Much of the work here is related to British and international standards. For example, the first stage in evaluation of test methods for determining the thermal endurance of varnished fabric insulation was one of the projects completed during the year. Data on the properties of varnished cotton, silk, nylon and terylene has been collected in preparation for a specification covering these fabrics, and critical reviews are being made of some existing British Standards. Coil test methods for determining the properties of impregnating varnishes are also under investigation with a view to incorporation in standards.

Industrial laboratories have been co-operating with ERA in an international programme to evaluate the precision and reliability of an IEC oxidation test for transformer oils. Results are being subjected to statistical analysis, and experimental work is being carried out on modifications to the test to shorten its duration. The year saw considerable attention to oxidation of transformer oils, including both field tests of transformers in the London area (some of which had inhibited and some uninhibited oils), and more basic investigations at Manchester College of Science and Technology and at Liverpool University.

There is evidence in the report that the traditional support for fundamental work on solid insulation is still being given by work at Leatherhead, and also through support for university investigations.

Circuit-breakers

Circuit-breaker problems, like insulation questions, have always received much attention from the ERA. Currently prominent is an attempt to meet a growing need for a satisfactory and economic method of testing circuit-breakers synthetically. Experimental work is in hand under the severe power limitations imposed by the existing Perivale plant. The Association is also studying current zero phenomena with an attempt to synthesise conditions in the throat of an air-blast circuit-breaker during the zero period. Backing this work is investigation of general arc physics.

Another typical investigation concerns vacuum circuit-breakers, switches and contactors, which have a very large interrupting ability in terms of rate of fall of current and rate of rise of restriking voltage. Difficulties have been met, however, in interrupting currents above about 10 kA peak. Work on a vacuum contactor has reached the stage of commercial development, and patents have been secured in several countries and have been taken up by some members. Away from the vacuum field, an investigation has started into the relative interrupting ability of a number of electro negative gases.

The work on steam properties which the ERA is supporting at Imperial College has yielded results extending up to 5,800 lb/sq in. and 750°C, and techniques have been improved to the point where the enthalpy of steam is known to an accuracy of about one part in 1,000.

In the cable field, attention has been concentrated on rating questions, notably the effects of different types of soil. Research on the behaviour of cables when carrying short-circuit currents has been extended to cover 11 kV screened paper-insulated cables, and p.v.c.-insulated cables and joints.

Surge Phenomena

The report indicates extensive activity in the field of surge phenomena. Amongst the work carried out is measurement at a power station under construction of surges transferred from a 132 kV substation, through a large generator transformer, to the generator terminals. The purpose is to assess the need for surge protection. Statistical analysis of lightning faults on h.v. distribution systems has been continued and is being extended; and results have been reported of a series of tests, in which h.v. surges were applied to an 11 kV wood-pole line. The rate of surge attenuation was found to be greatly reduced compared with steel-tower lines having earth wires.

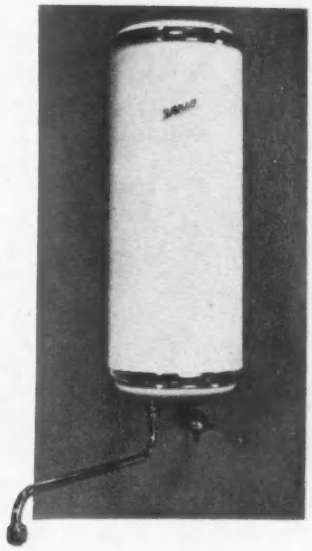
Study work on safe gaps in flameproof enclosures continues with determination of the maximum experimental safe gap for acetylene. Now shown as 0·010 in., it is hardly distinguishable from the 0·011 in. for hydrogen. Gaps have been determined for ammonia and performance of gasket and gasket materials has been investigated. In the intrinsic safety field, five more explosive gases have been investigated.

This account is far from covering the full range of ERA work. For example, the considerable activity in the rural electrification field is neglected, and the research on wind power, although this is now proceeding on a reduced scale. Also left without mention is the extensive work on heating buildings by electrical thermal storage methods, which was extensively reviewed in the ELECTRICAL TIMES not long ago.

Plastics-coated Steel for Water Heaters

NEW FACTORY OPENS

THE use of sheet steel coated with vinyl plastics—Stelvetite—in production of water heaters is by no means new, having been first introduced some two years ago. It is a process which obviates stove or vitreous enamelling as the plastics is already bonded to steel when it reaches the heater factory, but it does pose the manufacturer with other difficulties. One company, however, Aidas Electric, of Northolt, has ventured into this field by opening a satelite factory at Salisbury, exclusively for the manufacture of their "Two Plus" Sadia heater in an outer casing of Stelvetite.



Plastics-coated steel casing on the Sadia "Two Plus" heater gives matt finish. Initial production is in white and the unit costs £13 2s 11d inc. tax

Difficulties in Production

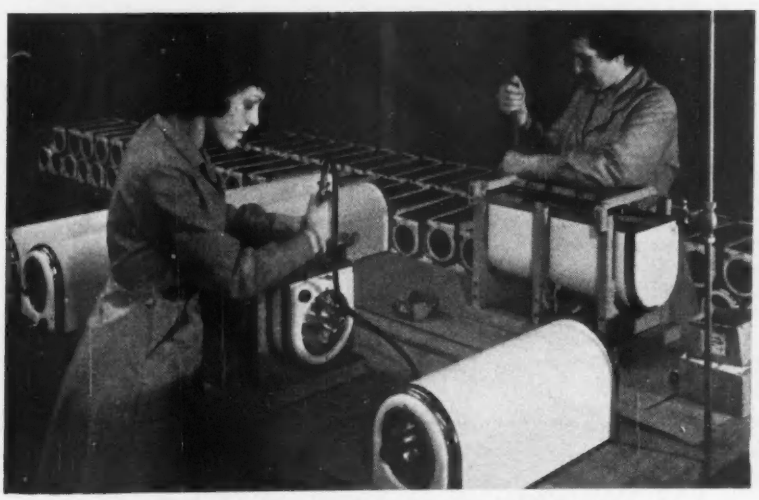
Although Stelvetite is a comparatively strong material, it has to be handled with greater care than sheet steel. This care would be even more marked in the case of smooth Stelvetite, the surface of which could be easily dented and damaged. For this reason, together with the fact that the gloss on this surface was not comparable with enamelling and also that a grained surface provided a pleasing contrast to gloss enamel, the company decided to use Stelvetite with a suedo-Morocco finish. The matt surface would not show normal scratches which might be encountered on the production line, and even slight cuts were not immediately obvious. It has been claimed by both Aidas and the makers of Stelvetite, John Summers Ltd., that this plastics-coated steel does not chip, a foreseeable danger with vitreous or stove enamel. On the other hand, it is possible that the vinyl plastics could be marked so badly during production that a heater casing would have to be designated for scrap, whereas an enamelled container, if it were chipped, could be re-enamelled. It could also accumulate dirt.

Advantages of Stelvetite

Aidas have decided to use this material as a contrast to their enamelled "Two Plus" heater, which will continue to be manufactured at Northolt. Apart from the advantage of dispensing with the enamelling operation, Stelvetite is extremely strong, so much so that it can be bent in a 90° angle and still show no sign of strain.

The problem of a longitudinal seam at the back of the heater has been overcome by making the unit "D" shaped. A frontal casing is manufactured in plastics-coated steel and a flat zinc-plated steel sheet is screwed into the rear of the section. Upper and base plates are punched out of Stelvetite on heavy presses and still the plastics does not break.

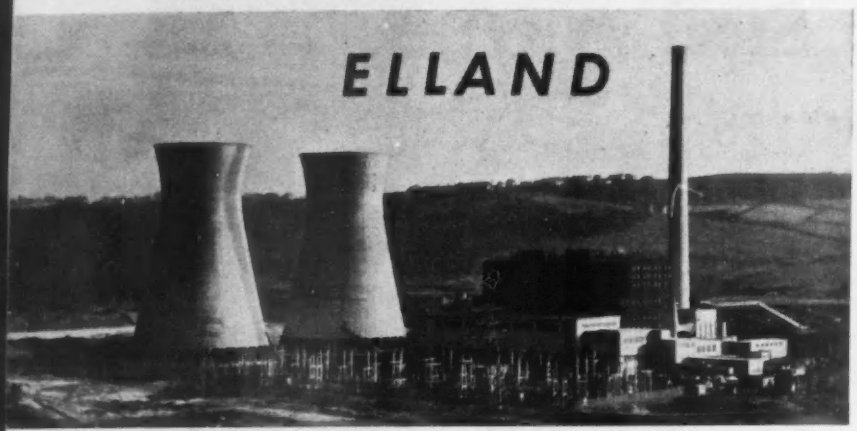
The company are confident as to the advantages of this material, but say it has to be handled with greater care to ensure the casing is unscathed at the end of the production line. Emphasising this care is the fact that casings are assembled in felt-lined troughs. The introduction of the Stelvetite "Two Plus" will be carried out complementary with production of the enamelled model at Northolt. Initial output is 250 heaters a week, but this will be increased to 1,350 a week when production is in full swing.



Final assembly of the Stelvetite "Two Plus," the casings held in felt lined troughs

The use of Stelvetite calls for different techniques to those used at Northolt not the least being an emphasis on factory-floor cleanliness as present casings are manufactured in white, although other colours are envisaged in the future. Plastics-coated steel arrives at the factory in 10 sq ft sheets which are cut to size by an electrically operated guillotine. Three presses, 80, 50, and 30 tons, stamp out top and bottom plates and a hand-operated roller and versatile brake press shape the main casing.

The factory, formerly a Spitfire production unit, is spacious and gives ample room for contemplated expansion. The complete heater is manufactured at Salisbury with the exception of a brass baseplate at present machined at Northolt as the necessary machine has not yet been installed in the new premises.



ELLAND base load Power Station

60 MW SETS WITH STANDARD STEAM CONDITIONS

Fig. 1. A view with the River Calder in the background

PROVIDING base generation for the Yorkshire Division is the station at Elland, officially opened last week by Mr A. R. Cooper, M.ENG., Member for Operations and Personnel, CEGB. The station, designed in conjunction with the Northern Projects Group of the CEGB, has three 60 MW sets. The first two sets were commissioned in June and September, 1959, and the final set in February, 1960. The station has standard steam conditions of 900 lb/sq in., 900°F, but is a little unusual in having boilers of two makes, one result of the initial design which was for a single unit station. Elland achieves a sent-out efficiency of 30%, and although at present connected to the grid at 132 kV, future plans include the installation of a 275 kV switchyard with direct connection to a nearby 275 kV supergrid line.

The station, sited in a narrow valley, is on the south bank of the River Calder. The site chosen is near the main Wakefield-Manchester railway line, and reception sidings have been provided for six trains, each of 55 16-ton wagons. The site was liable to flooding and has, in consequence, been raised above the highest anticipated water level. To prevent nuisance in the valley from the station, an unusually high single chimney of 400 ft has been built, and the cooling tower sites were also carefully selected for the same reason.

Station Layout

Elland station has a particularly compact and economical design. From the basement level to the operating floor the height is only 20 ft, markedly less than in most power stations and a feature which allows of reduced pumping power as well as lower building cost.

The three turbo-alternators are housed transversely in the turbine hall. An annexe, linking the turbine and boiler houses, contains the boiler feed pumps at basement level, while the turbine and boiler control and auxiliary switchgear panels are mounted in this annexe at operating floor level. Partly because of the small turbine basement depth, the boiler house operating floor is 10 ft above that of the turbine hall. To the south of the boiler house are the catenary coal bunkers, air heaters, electrostatic precipitators and the chimney.

Most of the station's coal is obtained from the South Yorkshire coalfield. It is low grade, with a calorific value between 9,200 B.Th.U./lb to 10,000 B.Th.U./lb, up to 27% ash content and as much as 14% moisture. Eventually, the station will have coal storage for 60,000 tons and at present, station ash is being used to reclaim the remainder of the planned storage site. The rail wagon coal is tipped on to a conveyor belt and taken to a transfer tower containing screening and crushing plant before being passed either to the boiler bunkers or to a temporary coal-storage site.

Boiler Plant

The three unit boilers are each rated 550 klb/hr, with stop valve conditions of 950 lb/sq in. gauge, 925°F and a final feed temperature of 385°F. No. 1 boiler is a corner-fired unit of the two-drum, natural-circulation type. The burners are supplied with p.f. by vertical roller-and-table pulverising mills driven by constant-speed motors. The associated exhauster motors are N.S. variable-speed machines rated 180 h.p. to 52 h.p., 1,470 r.p.m. to 960 r.p.m. Control of superheat is achieved partially by tilting the burners, but also with supplementary control by automatic spray de-superheaters. The furnace gases pass through the superheaters at the top of the furnace, down through the economiser banks and then through underfloor ducts to the air heaters outside the building.

For the Nos. 2 and 3 boilers, a single-drum, natural-circulation design has been used. These boilers are each fed by five constant-speed horizontal pulverising mills, consisting of a beater, an attrition and a fan stage. The mills are driven through a common shaft by an induction

PLANT DETAILS.

Boilers:	**Boiler 1.**	**Boilers 2 and 3.**
Furnace heating surface sq ft	10,440.	9,020.
Boiler heating surface sq ft	1,790.	9,280.
Primary superheater surface sq ft	17,080.	17,100.
Secondary superheater surface sq ft	4,140.	11,600.
Economiser heating surface sq ft	50,544.	19,290.
Number of mills	Four.	Five.
Mill motors	130 h.p. 415 V.	250 h.p. 3·3 kV.
Type of mill	"Lopulco" IM14.	Brown-Riley.
P.F. burners	16.	10.

Turbo-alternators:	
Vacuum at c.m.r. (30 in. barometer)	28·7 in. Hg.
No. of impulse stages h.p.	19.
No. of impulse stages l.p.	2×6.
Main exciter	252 kW.
Pilot exciter	2 kW.
Condensing surface set	60,000 sq ft.
Cooling water set	36,500 g.p.m.
Capacity of pump	43,500 g.p.m. at 35 ft head.
Pump motors	3×550 h.p., 325 r.p.m.
Tower pump capacity	43,500 g.p.m. at 50 ft head.
Tower pump motors	3×780 h.p.
Cooling tower capacity	2×3,900,000 g.p.h.

Transformers:	
Generator	3×72 MVA 132/11·8 kV.
Station	2×7·5 MVA 132/3·3 kV.
Unit	3×6 MVA 118/3·3 kV.
Auxiliary	2×1,250 kVA 3·3 kV/433 V. 4×750 kVA 3·3 kV/433 V. 4×200 kVA 3·3 kV/433 V.

Switchgear:	
Main switchgear	3,500 MVA/132 kV.
Auxiliary switchgear	3·3 kV air-break and 415 V air-break.

motor. Front wall firing is used for these boilers and, since the burners are fixed, superheat is instead controlled automatically by dampers which regulate the flow of gases through the primary superheater. Secondary regulation is by spray de-superheaters, also controlled automatically. Each boiler has two i.d. and two f.d. fans driven by 266 h.p. and 254 h.p., 740 r.p.m. induction motors. The boiler operation can be controlled automatically from the turbine floor control stations.

Ash is removed from the furnace hoppers by high-pressure water jets and sluiced to a sump. High-pressure water ejectors also extract dust from hoppers associated with the economisers, air heaters, precipitators and chimney. Each boiler discharges to the chimney duct through electrostatic precipitators.

Turbo-alternators

The turbines are designed for stop valve conditions of 900 lb/sq in., 900°F. They are two-cylinder, close-coupled machines with only three bearings and run at 3,000 r.p.m. Impulse blading is used in both the h.p. cylinder and the double-flow l.p. cylinder. Bled steam from the turbine provides five stages of feed heating. The double-flow l.p. cylinders are mounted over the twin condensers, each with three passes and with their 20 ft long tubes expanded into the condenser end plates.

The alternators generate at 11·8 kV and provide a c.m.r. of 60 MW. They are cooled by hydrogen at 15 lb/sq in., circulated through water coolers mounted in the stator casing. Each machine has direct-coupled main and pilot exciters, with open-circuit air-cooling systems.

Feed and Cooling Water

Condensate is extracted from each condenser by one of two 100% duty, two-stage vertical-spindle extraction pumps with a capacity of 750 g.p.m. The feed then passes through three low-pressure heaters, of which the third is a combined high-level heater and deaerator. From the deaerators, water passes to the feed pump intakes. Each unit has two 100% duty feed pumps rated 650 klb/hr at a discharge pressure of 1,205 lb/sq in. and driven by a 1,400 h.p., 3·3 kV, 2,964 r.p.m. motor.

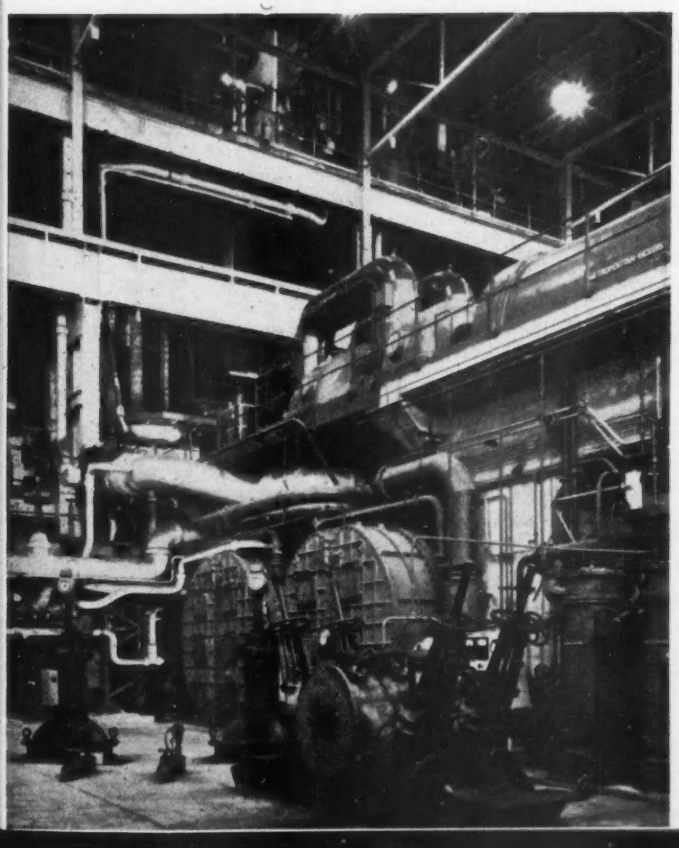


Fig. 3. A view of No. 2 set from the turbine house basement which shows the comparatively shallow basement construction used

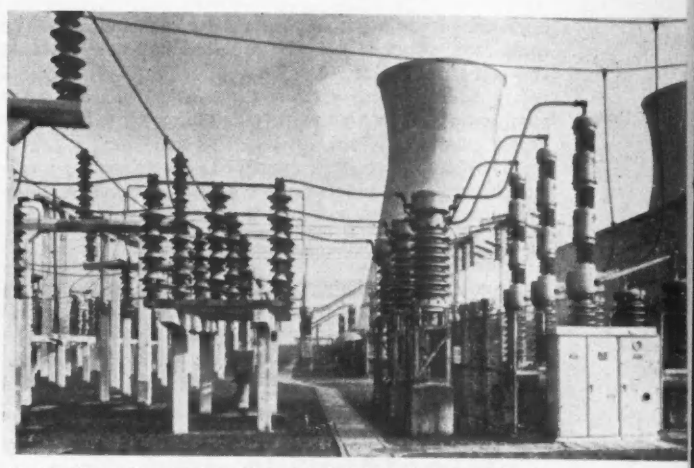


Fig. 2. The outdoor switchyard is equipped with air-blast circuit-breakers rated 132 kV 3,500 MVA. Layout of the switchyard is conventional, with duplicate busbars, section isolators and bus coupler

The make-up water required, amounting to about 1%, is controlled by the level of water in the deaerator tank. Raw water is obtained from the town supply and also from a borehole well on the site capable of yielding 10,000 gal/hr. The raw water is treated in a Neckar ion-exchange softening plant before being admitted to the two-level storage tanks in the boiler house, both of which are above the deaerator.

The cooling water system is designed to take water from the river and combine it with water circulated through the two cooling towers to give the best possible utilisation consistent with river flow and temperature

PRINCIPAL CONTRACTORS AND SUB-CONTRACTORS

Civil engineering consultants	Brian Colquhoun and Partners.
Architects	Kitson, Parish Ledgard and Pty.
Site clearance and earth works	Holland & Hannen and Cubitts.
Main building work and turbo-blocks	M. Harrison.
Main structural steelwork	Heenan, Beddow and Sturney.
Chimney, r.i.c.	Tileman.
Cooling towers	Davenport Eng. and Holst.
Boiler No. 1	Yarrow.
Boiler No. 2 and 3 and p.f. equipment	John Brown Land Boilers.
Dust extracting plant	W. C. Holmes and Sturtevant.
Sootblowers and valves	Hopkinsons.
P.F. equipment No. 1	International Combustion.
I.D. and f.d. fans	James Howden and Aerex.
I.D. and f.d. fan and auxiliary motors	Laurence Scott and Electromotors.
Instruments and controls	George Kent.
Turbo-alternators, boiler feed pump motors, turbine supervisory equipment and auxiliary motors	AEI.
Feed water heating and condensing plant	Vickers-Armstrongs.
Extraction pumps, river and tower pumps	Drysdale.
Boiler feed pumps	Hathorn Davey.
Control gear	Allen West.
River and tower pump motors	ECC
Circ. water valves	Blakeborough.
Ash handling plant	Babcock and Wilcox.
Coal handling plant	Robert Dempster.
Generator transformers	Ferranti.
Station transformers	Crompton Parkinson.
Unit aux. transformers	Yorkshire Electric Transformer.
Unit aux. transformer No. 3	Denis Ferranti.
132 kV and 415 V switchgear	English Electric.
3·3 kV switchgear	AEI.
Main, auxiliary and control cables	Crompton Parkinson.
Batteries and rectifiers	Chloride Batteries.
Telephones	STC.

limitations for the outfall. Water is drawn from the river by three vertical-spindle centrifugal pumps driven by outdoor constant-speed motors. The water passes through balanced rotary screens before entering the condensers and returns along twin concrete culverts, either directly to the river or for pumping to the towers. The two cooling towers are of hyperbolic concrete construction with cooling ponds interconnected, both between the towers and also with the cooling water intake and outfall from the river.

Electrical Plant

The three turbo-alternators are solidly coupled through copper busbars to 72 MVA generator transformers housed in an annexe outside the turbine building. The transformers are connected to a 132 kV switchyard equipped with air-blast circuit-breakers. The switchyard layout is conventional with duplicate busbars, bus section isolators and bus coupler. Provision has been made to extend the 132 kV switchyard and to construct an additional 275 kV section.

The larger station auxiliaries are driven by 3·3 kV motors controlled by air-break switchgear. Air-break switchgear is also used for the smaller motors, which are energised at 415 V.

Each set is controlled from a control centre in the annexe between the turbine and boiler houses. These control centres are open, but they have acoustic hoods to give some sound proofing. The units can be operated under automatic control to follow the electrical demand. The station control room overlooks the turbine house and includes the voltage regulator panels and switches for the remote operation of the air-blast switchgear.

Electronics aid for medicine

KELVIN LECTURE SURVEYS RESEARCH APPLICATIONS

EXAMPLES of how electronic techniques can assist in the diagnosis and treatment of disease were described in this year's Kelvin Lecture, given at the Institution of Electrical Engineers last week by Prof R. F. Woolmer, F.F.A.R.C.S., V.R.D., of the Royal College of Surgeons.

Prof Woolmer began by outlining the sensing system developed by nature for the control of carbon dioxide in the blood. Many systems in the body, he said, had the attributes of position and velocity control servo systems; in the case of the carbon dioxide control, blood bathed sensing elements which detected the CO_2 content and transmitted this information to a control centre in the brain. From the brain, signals were sent over nerves to effect changes in the muscles controlling the rate of respiration, so as to maintain the correct level of carbon dioxide in the blood stream.

Recorded Heartbeats

Although electronic techniques were not yet so refined as those of nature, which allowed direct measurement in the blood, a system had been developed for measuring the blood CO_2 content, indirectly, by infra-red analysis of breath. Prof Woolmer demonstrated this equipment by closed-circuit television, showing a patient breathing under normal conditions and, when the carbon dioxide content of the blood was artificially increased, with a consequent increase in the breathing rate. The body's regulating system in this case might be deranged if the nerves linking the control centre in the brain to the muscles became damaged at either end. Such damage might occur in infantile paralysis, or result from administration of a poison, such as curare, affecting the muscles themselves. In certain forms of infantile paralysis it was possible to restore correct performance by an electronic signal injected into a nerve of the neck. However, this was not only rather impracticable, but also, in time, the nerve was liable to degenerate. If the body muscles were paralysed, it was possible to use a photo-control system to detect the feeble movements the body was able to make and amplify them sufficiently to operate some form of breathing machine. Prof Woolmer demonstrated the characteristic rhythm of a normal heart and that of one damaged by rheumatic fever by showing typical cathode ray traces. He explained that, in the operating theatre, it was often convenient to use aural reproduction of the patient's heart beats, rather than visual representation.

The remarkable performance of the heart was typified, he said, by it performing many hundreds of millions of operations during a lifetime, by circulating blood through 10,000 miles of piping in the body, and by its ability to provide 8 or 9 times normal flow during physical exertion.

By tape recording the behaviour of healthy and diseased hearts it was possible for research workers to compare and analyse a patient's condition. Prof Woolmer played over to the audience a tape recording of typical diseased or damaged hearts with weak or irregular beats, comparing them with his own, which, he said, "was beating fast with deference to the importance of the occasion but nevertheless with impeccable regularity!"

Blood pressure was also regulated by a delicate system in the body which could not yet be reproduced, but, again, it was possible to measure it indirectly by applying pneumatic pressure to a blood vessel and amplifying the response.

Turning to cerebral activity, Prof Woolmer said the brain was very economical of power. Signals of only a few microvolts were developed. Nevertheless, it had been possible to measure these signals and even apply them to the automatic control of anaesthesia, since the brain electrical pattern varied as the depth of anaesthesia was increased. However, such machines were expensive and were not yet considered sufficiently safe to be used without an anaesthetist in attendance.

"Long-tailed Pair"

Electronic techniques also using an infra-red beam had been applied to the determination of the effects of different pain-killing drugs. By injecting drugs into rats or mice and then applying an infra-red beam to the animal's tail, the brain's response time could be measured. When the animal felt the heat he flicked his tail and the movement could be recorded. The experiments were normally performed with a duplicate undrugged control rat, the medical equivalent of the electronics engineers' "long-tailed pair."

Although electronics had many applications in the medical field, the incompatibility of electricity and certain anaesthetics had to be guarded against, particularly in the operating theatre. Many hospitals now had their own electronic workshops, and Prof Woolmer concluded by referring briefly to work in fields outside his own specialised interest concerned with ultrasonics, and radiology.

Harmonics for excitation

LARGE SET TECHNIQUES DESCRIBED TO AMERICAN POWER CONFERENCE. E.H.V. PROBLEMS DISCUSSED

PAPERS presented to the 1961 American Power Conference, held in Chicago a few weeks ago, ranged over a wide field of electricity supply topics. We hope to summarise several of these papers in coming weeks, and the present article* makes a start with a paper on a novel excitation system for large alternators, and three papers concerned with h.v. lines.

Third-Harmonic Excitation

Use of harmonics in the flux wave of synchronous generators to provide power for excitation is discussed by F. I. Biggs and P. I. Nippes (Elliott Company, Carrier Corporation, Ridgway, Pen). Their starting point is the state reached in the development of silicon rectifiers, which has made economic the rectification of substantial quantities of energy by static means. This has made possible techniques such as brushless excitation, but the system they suggest is different from this in important respects.

The flux wave in any commercial synchronous machine consists of a fundamental plus various amounts of odd harmonics, present due to saturation of rotor teeth, rotor and stator slotting and, in salient pole machines, the shape of the pole head. These harmonics occur also in the generated voltage wave shape, in amounts depending upon chording and distribution of the stator winding. In most cases of three-phase generation, the third harmonic and odd multiples of it can do no useful work unless there is a four-wire system. The fundamental idea behind the harmonic excitation design is that the triplen harmonics in the flux wave should be converted into useful power in a separate stator winding. If this is done, then the power is gained without any additional excitation requirements imposed on the main generator field.

Windings suitable for this purpose can be constructed in any machine whose stator is so slotted that it will accommodate a balanced additional stator winding of as many poles as the order of the harmonics times the poles on the rotor.

At present, a 25·6 MVA, 13·8 kV, 3,600 r.p.m. hydrogen-cooled turbine generator is being built, supplied with a complete harmonic excitation system. Previously, other production machines have been tested to determine harmonic performance. Initial tests were made on a 13·5 MVA generator, in which a temporary seven-phase third harmonic winding was used. Fig. 1 shows results of tests on a 44·1 MVA machine from the aspect of excitation requirements. It is important to note the rate of change of harmonic voltage as compared with machine excitation requirements. The curve shows that for usual power factors the harmonic voltage follows closely the curve corresponding to field voltage requirements at 0·85 power factor. For zero power factor lagging, voltage increases at a rate lower than that required. Should it be necessary to operate in this condition, the available harmonic voltage would have to be chosen to meet low power factor, and control equipment designed to deal with the excess voltage at improved power factor operation.

Third harmonic voltage magnitudes vary with machine design and system conditions. When a machine is operating on a balanced three-wire system there is no linkage between main and harmonic winding, so that full harmonic flux is available for use in the harmonic winding regardless of the load on the main winding. With four-wire operation except when the main winding has a 2/3 pitch, some of the third harmonic power is circulated in the main system, which, in effect, reduces available harmonic winding voltage. For delta-connected machines, except those using a 2/3 pitch, harmonic excitation may be difficult to apply.

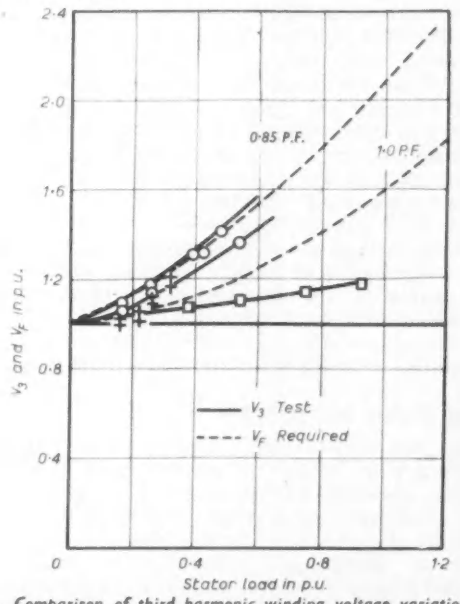


Fig. 1. Comparison of third harmonic winding voltage variation and machine excitation requirement as a function of loading of the main winding. Circles show test points in the range 0·9 p.f. under-excited to 0·85 p.f. over-excited; crosses, less than 0·9 p.f. under-excited; squares, zero over-excited. Dotted lines show voltage required between 0·85 and 1·0 p.f.

In a design for a complete harmonic winding and excitation controlled system for a 25·6 MVA turbine generator, changes in standard design were avoided, other than those involved in adding the harmonic winding. A class H insulated continuous cable is used for the winding, tested at 2·5 kV and capable of withstanding 30 kV. The cable is held securely to stator wedges with two layers of polyester glass tape at about 3 in. intervals, with epoxy adhesive at the wedge surface. Cable connections are copper-welded at the terminals.

* All the papers summarised were presented at the 23rd annual meeting of the American Power Conference. The report of the Conference proceedings will be published in the USA in November.

Table I. Comparison of Excitation Systems

	Conventional d.c. Exciter	Rectified Main Gen. Output	Aux. a.c. Gen. Conventional or Inductor	Rotating Rectifier (Brushless)	Harmonic
Is an additional rotating machine required?	Yes	No	Yes	Yes	No
Is additional floor space in operating room required?	Yes	No	Yes	Yes	No
How many sets of brushes and sliding contacts must be maintained?	2	1	2 con. type 1 ind. type	0	1
Can generator be kept in service in event of failure of usual excitation source? ...	Yes	Yes	Yes	No	Yes
Are generator output and/or field requirements affected?	No	Yes	No	No	No
Are step-down transformers required?	No	Usually	No	No	No
Is an auxiliary source to initiate excitation required at start-up?	No	Yes	No, con. type Yes, ind. type	No	Yes
Is it necessary to shut down to replace rectifiers and fuses?	—	No	No	Yes	No

Harmonic power is controlled in a standard Elliott static voltage regulator with a push-pull magnetic pre-amplifier, a power magnetic amplifier, silicon rectifiers and protective devices that include a non-linear resistor connected across the field winding to absorb negative currents induced from the generator field. With the regulator in operation the generator voltage is maintained constant to within $\pm\frac{1}{2}\%$. Because of the rising characteristic of the harmonic voltage with load, very little action is required by the voltage regulator to keep voltage constant. Installation of the 25·6 MVA machine with harmonic excitation system is scheduled for the early summer of 1961.

One of the advantages of the harmonic excitation is its high efficiency, since there is no core loss or excitation requirements additional to what is already inherent in the main machine. Indeed, use of harmonic excitation actually reduces the harmonic content in the main generator wave shape, thus improving machine TIF.

Apart from application of harmonic power for excitation purposes, there is also the possibility that it might be used to drive some auxiliaries. Tests have indicated that in the normal turbine generator there is about 9% third harmonic content in the flux wave. Not all of it can be recovered, but it is quite possible that enough can be developed to drive the boiler feed pump at high speed.

Wood Poles for 345 kV

Wood pole lines have been used for higher voltages in the US than in Britain, and recently the Illinois Power Company has been experimenting with the possibility of wood poles for a 345 kV line. This work is described by Mr T. W. Schroeder of the company and Mr J. E. O'Neil of Westinghouse Electric Corporation. It is estimated that in Illinois as much as 10% of total cost may be saved with wood pole construction as against steel tower lines. With existing 138 kV H-pole lines, advantages noticed over steel include saving in repainting, and good lightning performance resulting from relatively short span (about 220 yards) wood pole construction with unbonded pole top steel fittings.

As a preliminary to designing a 345 kV line, a test line has been set up at the Breed generating station of the Indiana and Michigan Electric Company located on the Wabash River. The line contains nine types of pole tower and is strung with single 1·75 in. diameter ACSR, although bundle conductors will probably be used for the final line. Tests are being made to check corona, radio noise and the possibility of wood burning from leakage currents. Hot line maintenance investigations are also being carried out.

Particularly important in the hot line aspect of investigation is the search for experience of electrical effects on maintenance personnel working in the electrostatic fields surrounding wood pole structures, and the effects of contact with pole top steel fittings which are not bonded and earthed. In some tests a conductor has been connected to the linesman's body or to various items of steel work on the pole structure and carried to a meter, with the other side earthed. Currents measured have ranged from zero to 1·15 mA. One case has occurred where a linesman was not earthed, and reported hardware and fittings as "uncomfortably hot" on initial contact.

Radio Interference

Two papers discussed radio interference noise generated by h.v. transmission lines. One of these, by Mr S. B. Griscom (Westinghouse Electric Corporation), propounds a theory regarding generation of radio noise on h.v. lines. His argument is that radio noise is principally caused by aerosols, which come within the strong electric fields regions immediately surrounding energised conductors. In fine weather, the aerosols are principally dust or soot particles, while in bad weather they are mainly rain drops or snow flakes. Various results are quoted in the paper to support the theory, although it is not claimed that conclusive evidence is advanced.

It is shown in the paper that smooth transmission conductors operating on a little over half the critical voltage gradient for air generate radio interference in fine weather. The effect of some aerosols present near such conductors was investigated theoretically and local electric field intensities were found to be increased 3 to 50 times.

Experience of the Bonneville Power Administration of Portland, Oregon, in designing e.h.v. lines for acceptable radio interference levels is discussed by Mr R. J. Mather and Mr E. H. Gehrig. The Administration operates over 4,000 miles of 230 kV lines, 230 miles of 287 kV lines and 340 miles of 345 kV lines. There is interest both in the effect of line noise both on radio reception and also on communication and relaying circuits. The latter aspect is important because carrier is relied on for protection.

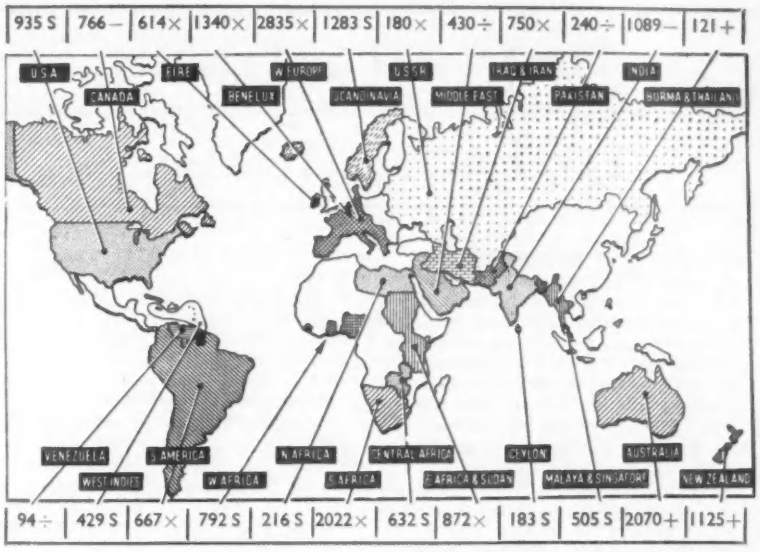
In urban areas where radio signal strength is usually high, it is easy to keep interference from power lines to less than 1/40th of radio signal strength. In rural areas, however, a ratio of 25:1 has to be accepted as a reasonable objective. At this level background noise is audible but not objectionable to most listeners.

Translated into conductor size, experience shows that 1·10 in. dia conductors are satisfactory for 230 kV to 242 kV; 1·38 in. dia for 287 kV to 310 kV; and 1·60 in. dia for 345 kV to 360 kV. Comparison between a single 1·60 in. conductor and a bundle 1·10 in. conductor in a 345 kV line shows that for 50% of the time radio interference level 150 ft from the line is about 3 dB higher than for the single conductor, while for less than 10% of the time it was about 6 dB higher for the single conductor.

Precautions in handling and stringing conductors, which are initially specified with care, and subsequent burnishing by a spring-loaded shaped hardwood block drawn over conductors during stringing, permit savings by reducing minimum conductor diameter to satisfy RI criteria.

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS IMPORTS *March*

A WELCOME improvement in the electrical export position occurred in March, the total value of goods listed in our table, at £25,908,715, being over £2¼ million up on the corresponding figure for February. But the total is still more than £1·2 million below the January figure. On the heavy plant side, exports of water turbines topped the £1 million mark and large switchgear also made a substantial contribution. Of the generating sets sent abroad, South Africa took the highest value.

Domestic appliance manufacturers had a good month with exports, too, their total of £3,048,762 being nearly £400,000 up on the previous month. Most items contributed to the improvement, particularly good increases being registered for vacuum cleaners, washing machines, refrigerators and food mixers. Of refrigerator exports, New Zealand took £43,189 worth, Canada £45,235, West Germany £58,139, and Sweden £35,762.

But for all electrical goods, Australia was again our best customer for the month, taking equipment to a value of £2,070,427, of which £232,520 was in respect of generators and motors, £428,264 for convertors, rectifiers, transformers and switchgear, and £136,632 for cables and wires.

Our imports again showed an increase for the month at £6,048,765, of which the largest value came from the USA (£1,801,463), and West Germany (£882,149), plus £274,010 from Sweden and £222,226 from Switzerland.

Description	Exports Value (£)		Imports Value (£)	
	Mar. 1960	Mar. 1961	Mar. 1960	Mar. 1961
Generators				
Diesel up to 200 kW	417,386	321,964		
Diesel over 200 kW	111,193	93,943		
Steam turbine driven	87,987	27,533		
Water and gas turbines	386,349	1,023,320	75,161	101,398
With i.c. and other prime movers	46,385	160,822		
Generators up to 200 kW	71,269	202,305		
Generators over 200 kW	80,926	77,969		
Generator parts	790,418	455,652		
Motors, f.h.p.	329,657	309,002		
Motors 1-250 h.p.	472,332	578,651	180,818	257,783
Other motors	392,470	531,070		
Motor starters and controllers	236,542	409,286		
Convertors and rectifiers	61,252	232,023	252,783	109,757
Transformers	763,427	605,868		
Switchgear, to 200A, mv	342,036	512,542	171,622	259,011
Switchgear, other	1,044,816	1,050,751		
Total, Electrical Plant	*5,634,445*	*6,592,601*	*680,384*	*727,949*
Batteries, primary and parts	535,503	732,027		
Lamps filament, over 28 V	102,484	107,317		
Lamps filament, under 28 V	25,717	46,149	89,803	93,113
Fluorescent tubular lamps	56,328	113,006		
Other lamps and parts	84,180	134,258		
Radio and electronic gear	3,727,878	4,886,905	1,481,863	1,736,229
Telephone and telegraphic equipment	1,457,818	1,842,729		
Cookers	32,595	49,174		
Other cooking appliances and parts	150,600	134,159		
Space heaters	26,126	33,971	238,547	229,253
Water heaters	24,835	36,077		
Other heaters and parts	101,299	194,495		
Electric irons	73,177	68,528		
Vacuum cleaners	129,642	233,772		
Floor polishers	89,157	59,986		
Food mixers	49,410	118,195		
Washing machines, domestic	410,165	667,417		
Dryers	27,634	44,933	411,607	300,718
Washing machine and dryer parts	89,110	119,351		
Domestic refrigerators and parts	754,735	880,862	964,611	247,592
Other appliances and parts	312,524	407,842		
Total, Domestic Appliances	*2,271,009*	*3,048,762*	*1,614,765*	*777,563*
Portable power tools	222,917	299,018		
Arc welding plant	102,185	128,424	65,598	70,780
Resistance welding plant	15,704	26,849		
Electric furnaces	69,165	102,896		
Signalling apparatus	131,087	191,264		
Commercial instruments	229,544	208,637	97,437	106,561
House service meters	173,480	198,593		
Wiring accessories	215,349	272,840		
Fans	109,938	159,320		
Lighting fittings and lanterns	363,695	350,894	131,011	154,765
Other lighting equipment	85,624	97,311		
Telephone and telegraph cable	609,613	276,756		
Paper insulated cables	660,756	547,601		
Rubber insulated cables	313,759	304,318		
Thermoplastic insulated cables	264,769	335,318		
Winding and similar wires	141,413	176,385		
Other cables and wires	180,829	264,405		
Total, all cables and wires	*2,171,139*	*1,904,783*		
Accumulators and parts	269,670	355,007		
Insulating materials	240,570	201,431		
Industrial electronic control gear	138,075	195,707	49,060	100,034
Electrical ware	134,926	115,784		
Permanent magnets	73,409	62,887		
All other articles	2,979,219	3,824,509	1,755,904	2,281,771
Total	21,665,408	25,908,715	5,965,825	6,048,765

new products and appliances

Modified push-button switches

SLIGHTLY modified so that it can be used in the MK grid-switch range is a push-button switch now fitted with three terminals so it may be wired as either "make" or "break," or both. One terminal is common and the other two appropriately marked for the purpose selected. In addition, the buttons are now moulded in red and green as well as the original brown or ivory. These switches are designed to fit any of the 1—4 gang grids for flush or surface installation work. Fixing centres are identical to others in the range allowing complete standardisation and interchangeability. *MK Electric Ltd., Shrubbery Rd, N.9.*

Solid electrolyte tantalum capacitors

TO supplement their existing "Castanet" range of liquid electrolyte tantalum capacitors, the Plessey Co. announce that they are to manufacture under licence from the Mallory Co. Inc. a range of solid electrolyte types. Among special features claimed for these capacitors are temperature stability and ability to operate at temperatures down to −80°C without loss of performance. Capacitance values available range from 0·33 μF to 330 μF depending upon the voltage rating, which can be from 6 V to 330 V d.c. Thus, maximum capacitance available for the 35 V rating is 68 μF. *The Plessey Co. Ltd., Ilford, Essex.*

M-R make compressor 'fridge

BREAKING into the compressor refrigerator market with their largest yet model, a 6·8 cu ft unit, are Morphy-Richards (Astral). Retailing at 66 gn, this 'fridge boasts a full width freezing compartment capable of holding 28 lb of frozen food. It has three adjustable shelves and a deep drawer for fruit and vegetables. Storage in the door liner includes two racks for eggs, dairy compartment and bottle storage space. This model, A.680, has a thermostatically controlled compressor unit operated by an interior mounted dial with seven settings. The square lined cabinet is 44·7 in. high, 23·5 in. wide and 24·2 in. deep. It is set on rollers and exterior finished in white or cream stove enamel with interior of blue high impact polystyrene. *Morphy-Richards (Astral) Ltd., Conduit St, W.1.*

Falco reduce cooker prices

AS a result of reorganisation at the Allied Ironfounders' Manchester and Falkirk factories, a price reduction in the Falco Royalty cooker is announced. It now sells at £59 10s as opposed to £72 9s. The cooker has not been altered in any way and is still available in white, cream or pastel blue. *Electrical Division, Allied Ironfounders Ltd., Corporation Rd, Audenshaw, Manchester.*

Hand vacuum cleaner

SUITABLE for cleaning upholstery, cupboards and car interiors, the recently introduced Siroma hand vacuum cleaner sells at £7 13s 9d including purchase tax. Weighing only 4½ lb and compact in design, the cleaner is finished in two tones of grey. One of the features is a large dust bag with sponge rubber sealing ring, and another the moulded rubber nozzle fitted with strip brush. The cleaner is powered by a universal type motor unit for use on standard voltage ranges. *Siroma Engineering Ltd., North Acton Rd, N.W.10.*

Furnace flame control

SAFE ignition and control of burners in industrial gas- or oil-fired furnace installations can be achieved using "Series 704 Flame Controller" equipment. Control is initiated by the modulated component of flame radiation acting on a lead-sulphide photo-cell whose output is fed to a transistor amplifier and switch. In a typical lighting-up sequence, as soon as the pilot flame appears it is detected by the photocell and the signal amplified to operate the transistor switch. This in turn energises a solenoid valve releasing the fuel supply to the burner, which is then ignited by the pilot. Conversely, should the burner flame go out, fuel supplies are automatically cut off and an alarm signal given. Equipment for the simultaneous control of up to six burners is available. *Ether Ltd., Combustion Safeguard Division, Stevenage, Herts.*

Battery shaver

POWERED by a 1½ V U.2. torch battery, Pifco's "Holiday" shaver costs 52s 6d. A micro-thin shaving head has two individually spring loaded blades and a fine guard is claimed to ensure smooth shaving. Made in Switzerland, the shaver comes in a plastics case with slide button control. *Pifco Ltd., Pifco Hse, Watling St, Manchester.*

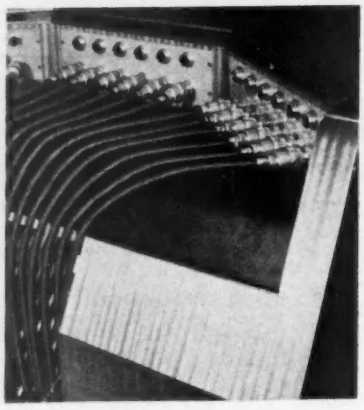
Flexible conduit for control desk

A RECENT application of "Conflex" flexible conduit has been in the routing of multiple sound, vision and control circuits through a BBC teleciné control desk. Each incoming circuit comprises a flexible conduit carrying a combination of coaxial, quad and single conductors laid up in specified formation and terminating in a plug connector. All circuit plugs engage with sockets on the desk panel. Plug and socket connections can be rearranged to suit particular routing requirements, the nature of the conduit permitting repeated flexing without damage to conductors. The installation is said to provide a cheaper alternative than a switched console for this sort of application. *Superflexit Ltd., Trading Estate, Slough, Bucks.*

Useful for the car. Siroma's new hand vacuum cleaner

◀ *Morphy-Richards first compressor 'fridge. A 6·8 cu ft model*

"Conflex" flexible conduit system applied to teleciné control desk ▶



Infra-red elements for 2 kW fires

AS well as introducing a 2 kW tangential fan heater selling at £11 19s 9d (ELECTRICAL TIMES, 6 April, 1961), Gatehill Beco have restyled several of their domestic heating appliances for 1961. Among these are 2 kW and 3 kW coal and log effect fires now available with infra-red elements. Another feature of these models is independent switching, allowing the coal effect to be used without heat. The fires are still made with normal elements, and sell at prices ranging from £12 8s 6d to £14 4s including purchase tax.

Wall mounted infra-red heaters too have undergone restyling. The Becosil 707 has been given an increased loading to 1 kW and provided with pilot light and redesigned safety guard. Newcomer to this range is the Becosil 505 with bullet shaped ends which has 750 W loading. Free standing version of the wall mounted heater, Becosil 808, has had its loading increased to 1 kW but remains at the old price of £6 19s. The wall heaters sell at £5 12s 2d and £3 19s 9d, respectively. *Gatehill Beco Ltd., Kennard Rd, Stratford, E.15.*

Subminiature potentiometer

A TINY potentiometer, no more than $\frac{1}{8}$ in. dia, is now available for use with transistorised circuits. Known as the "Clarostat," it has a composition element and can be supplied with printed-circuit type tags. Spindle diameters can be either $\frac{3}{16}$ in., $\frac{1}{4}$ in. or $\frac{1}{8}$ in. *AB Metal Products Ltd., Walkden Hse, Melton St, N.W.1.*

Restyled "Iced Diamond"

WITH a view to providing greater storage capacity in the minimum kitchen space, Hotpoint have redesigned the "Iced Diamond" and introduced a 4 cu ft model, the F40. This new model, which is 21 in. square, stands 34$\frac{1}{4}$ in. high and has the same quantity of insulation as the 3·7 cu ft model, but it is more tightly packed. Launched at the start of Hotpoint's fortieth birthday year, this model has the feature of a flexible one-piece polythene ice tray which enables individual cubes to be ejected without disturbing other pieces. F40 is set on rollers and obtainable in white or cream with magnetically sealed door. It is suitable for building into a line of units, under an existing working surface or, with the addition of a vitreous enamel table top, an optional extra, can be used as a free standing model. It sells at 61 gn including tax and a further 3 gn for the table top.

Another model, the X37, is claimed to provide large storage space at low cost and came to the range last month. This model, which replaces ES37, has a cubic capacity of 3·7 cu ft and sells at 47 gn. An enamelled table top, optionally extra, costs 3 gn. *AEI-Hotpoint Ltd., 33 Grosvenor Pl, S.W.1.*

Variable speed drive controllers

AMONG the latest variable speed d.c. drive control equipment by Lancashire Dynamo, the "Transidyne" unit provides remote finger-tip speed control, both forward and reverse, with regenerative braking. It comprises a motor-generator set integral with semiconductor control circuitry housed in a single cubicle and is available for use with drive motors having ratings in the range 1 h.p. to 10 h.p. Various control characteristics are made possible by suitable combinations of standard sub-assembly and plug-in units. Covering motor ratings 1 h.p. to 3·5 h.p., the smaller BMC.1 equipment makes use of a thyratron and metal rectifier bridge circuit to give variable speed control and is said to give good speed regulation under fluctuating loads. All models incorporate built-in overload protection and optional extras include provision of reversing and dynamic braking facilities. Equipment has also been introduced for automatically controlling the feed of raw material into grinding and crushing mills to ensure full utilisation of the mill's capacity without overloading the drive motor. Output from a current transformer connected to the mill motor input is fed back to the controller, which thus regulates feed motor speed to give optimum delivery of material. The equipment is manufactured for feed motors ranging from 0·5 h.p. to 4 h.p. *Lancashire Dynamo Electronic Products Ltd., Rugeley, Staffs.*

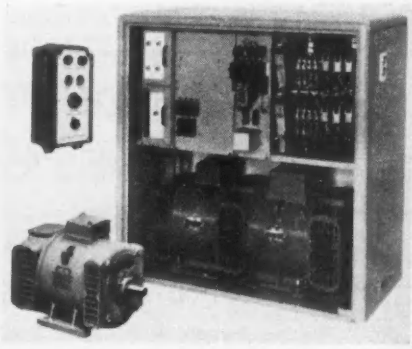
Data plotting equipment

TO simplify conversion of tabulated data into graphical form, Bryans Aeroquipment have introduced a key-board unit for use with their existing "X" and "Y" co-ordinate plotting table. The latter equipment is of the pen-recording type designed to convert d.c. voltage inputs into corresponding pen positions. The point plotter, operating from mains supply, has four decades of keys for each co-ordinate axis each of which can be made to register either positive or negative. It also incorporates "scale" control enabling the full area of the graph paper to be used for any particular set of data. Plotting accuracy is said to be 0·2%. Supplementary equipment includes a trace interrupter, which when connected to the co-ordinate plotting equipment enables the production of three different trace patterns. *Bryans Aeroquipment Ltd., 1 and 15 Willow La, Mitcham, Surrey.*

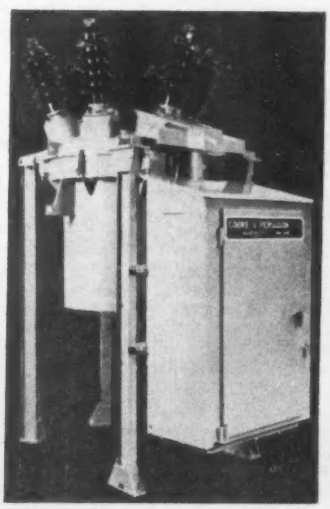
Emergency start-up equipment

A SIMPLE but effective system for emergency starting of standby generating sets employs a falling weight to open a valve controlling compressed air to the pneumatic starter of the prime mover. During standby the weight is held suspended by a mains energised solenoid to be released automatically should a mains failure occur. The starting cycle having been initiated, pressure built up by the generating set lubrication system is utilised to reclose the air valve and reset the operating weight in readiness for the next emergency start. The system, originally developed by the UKAEA, is now available for industrial applications. *Pyropress Engineering Co. Ltd., 339a Bedford Rd, Bedford.*

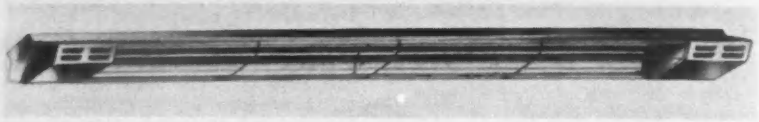
Larger 4 cu ft "Iced Diamond" by AEI-Hotpoint



"Transidyne" control cubicle provides finger-tip speed control, both forward and reverse, for industrial motors in the range 1 h.p. to 10 h.p.



Type OE1, o.c.b. by Cooke and Ferguson (associate company of Crompton Parkinson Ltd.) designed primarily for overseas' markets. Reference to this unit was made on p. 646 of 20 April issue of "The Electrical Times." The illustration appearing on that page in fact referred to the Type OE7, also mentioned in the text



AEI "Slimline" industrial radiant heater uses single "Pyrobar" element

Industrial radiant heater

FEATURED at the recent ASEE exhibition, the new "Slimline" industrial radiant heater has a specially treated extruded aluminium body and incorporates a single "Pyrobar" Inconel sheathed element. This combination is said to afford a high degree of resistance against atmospheric corrosion while its unobtrusive appearance remains in keeping for both industrial and commercial applications. The easily detachable parabolic reflector is of anodised aluminium, giving a beam angle of about 50°. Three ratings available are: 1 kW, 2 kW and 3 kW, with corresponding body lengths of 3 ft 3 in., 5 ft 10 in. and 8 ft 6 in. To cater for various mounting arrangements, each unit is supplied with adjustable brackets. These permit wall and ceiling fixing at any angle or in pairs. Chain, rod or conduit suspension is also provided for. *AEI Ltd., Transformer Division, Trafford Pk, Manchester 17.*

Electromagnetic counter

LONG life, corresponding to about 300 million counts, is claimed for the improved "Series 400" electromagnetic counter. Built into a die-cast alloy case of dimensions 2¾ in. by 2$\frac{7}{16}$ in. by 2¼ in., the counter has four sunken white numerals 7/32 in. high and is available with either electrical or mechanical reset. Price for the d.c. version is £7, with an extra 15s for the a.c. version. *Counting Instruments Ltd., 5 Elstree Way, Boreham Wood, Herts.*

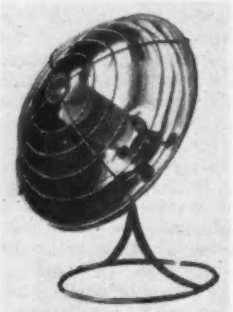
Cordless drill

ALTHOUGH it will not be available on the market here for some months yet, a new pistol-grip drill powered by batteries housed in the handle and weighing only 4 lb is a revolutionary addition to the Black and Decker range of powered tools. It has been developed by the US parent company. The secret—and secret it is at the present—lies in the battery. This when fully charged, will run the motor, which is said to be of a new design, for long enough to drill 75 ¼ in. holes ¾ in. deep in wood or their equivalent before recharging. Designed mainly for the agricultural or industrial user for occasional work remote from electricity supplies, its price is expected to be about £18 to £20, including the battery charger. *Black and Decker Ltd., Harmondsworth, Middx.*

Battery powered drill by Black and Decker

Redesigned bowl fire

WITH a view to the winter season, Metway have redesigned their "Superway" bowl fire, DA 150, by giving it a completely new base. It will be known as the "Superway New Style," but will retain its price of £1 1s 8d, including tax, and also the list number. The new circular base is of plated steel as is the guard. It is loaded to 600 W and has coil type heating element and 9½ in. polished aluminium reflector. *Metway Electrical Industries Ltd., Brighton 7.*



High impedance valve voltmeter

SPECIAL feature claimed for the new "Model 172A" portable multi-range valve voltmeter is an exceptionally high input impedance. This is 11 megohms on all d.c. ranges and 830 kilohms to 1·5 megohms for a.c. Mains operated, the instrument is said to require only a short warming up period and to remain stable over long periods of operation. To ensure reliability printed circuitry is employed coupled with the use of specially selected valves. The instrument incorporates seven d.c. and a.c., r.m.s. ranges covering 0—1·5 V to 0—1,500 V, while d.c. measurements up to 30 kV can be made by means of a special e.h.t. probe. Also included are a.c. peak-to-peak ranges up to 0—4,200 V and resistance ranges from 0—1,000 ohms to 0—1,000 megohms. Frequency coverage is said to exceed 200 Mc/s. *Taylor Electrical Instruments Ltd., Montrose Ave, Slough, Bucks.*

In situ transistor tester

DESIGNED specifically for checking grounded emitter current gain for transistors while in circuit, the "T.T.1." portable tester will handle both p-n-p and n-p-n types in the low and medium power range. Current gain is measured in two ranges, 0-50 and 50-500, with provision for checking leakage current over the ranges 0-100 μA and 0-1 mA for transistors out of circuit only. To afford maximum convenience of operation the instrument features specially designed probes and has retractable legs fitted to the front for bench working. Battery operated and having dimensions 6 in. by 6½ in. by 7 in., price of the tester is £40. *Advance Components Ltd., Roebuck Rd, Hainault, Ilford, Essex.*

Latching relays

TWO versions of a new latching relay for a.c. or d.c. operation are available; one is hand reset, the other by electrical impulse. Each can be supplied with up to eight pairs of contacts in any combination of changeover, normally open or normally closed types. Typical contact ratings are 6 A at 230 V a.c. or 1 A at 230 V d.c. Operating coils are rated at either 440 V a.c. or 230 V d.c. *Electrical Remote Control Co. Ltd., Bush Fair, Tye Green, Harlow, Essex.*

EE cut 'fridge price

NEW manufacturing techniques and increased demand are claimed by English Electric to be the reason for reducing the retail price of the 2·7 cu ft Slimline Junior refrigerator by 6 gn. The reduction took effect from Tuesday making the price 42 gn including tax.

National distribution begins this week of the E.E. new double-oven cooker, model 2034 which was launched at the Ideal Home Exhibition. It will sell at 66 gn. *English Electric Ltd., English Electric Hse, Strand, W.C.2.*

TRADE PUBLICATIONS

CROMPTON.—Booklet describing recent development in traction batteries. Crompton Parkinson Ltd., Crompton Hse, Aldwych, W.C.2.

ERM.—Illustrated booklet on electrical busbars, their design, manufacture and installation. Enfield Rolling Mills Ltd., Brimsdown, Enfield, Middx.

GEC.—Technical description of liquid earthing resistors. GEC Engineering Group, Erith Wks.

HAGAN.—Illustrated leaflet giving details of ring balance meters. Hagan Controls Ltd., Grosvenor Pl, S.W.1.

JOHNSON, MATTHEY.—Revised data sheet giving details of range of platinum wound electrical resistance furnaces and control units. Johnson, Matthey and Co. Ltd., Hatton Gdn, E.C.1.

MULLARD.—Booklet on simple oscilloscope measurements designed for educational purposes and pamphlet on low voltage power supply, also intended for education. Mullard Ltd., Educational Service, Mullard Hse, Torrington Pl, W.C.1.

PILKINGTON BROS.—Revised catalogue pages illustrating redesigned insulators for pages 9-10 of Armourlight toughened glass insulator brochure. Pilkington Bros. Ltd., St. Helens, Lancs.

RESEARCH AND CONTROL INSTRUMENTS.—Catalogue of radiation protection materials, equipment and accessories. Radiation and Control Instruments Ltd., King's Cross Rd. W.C.1.

PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to make it easier; all make instructive reading.

Economic Water Heater

MAY I assure both Mr R. I. Smith and *Slow Neutron* that the arrangement I described for a domestic water heater is one that has been in use for over three years and has given satisfaction. The push is a 230 V bell-push, which is usually designed for one of the most destructive duties—a highly inductive bell coil—and, in any case, it only makes the circuit, not breaks it. I fail, however, to understand *Slow Neutron* when he suggests that the electric supply is cut off if a small amount of water is run for washing purposes. If the current is on when the water is run, it will remain on until the full contents of the tank are up to temperature. In so far as cost is concerned, a motorised time switch would cost about £6 today; a relay, not more than £1 to 30s.—*RTC.*

Useful Extension Lead

MY attention has been called to an item which appeared on page 601 of the April 13 issue under the above heading in which a description is given of an extension cable, presumably at mains voltage, which at one point incorporates a short length of 3-core cable with a plug at each end. This is surely not the sort of advice which should be published.

If the correspondent really finds so frequent a need for a contraption of the type described, would it not be less trouble and far safer to install a permanent conduit terminating in a weatherproof outlet outside the workshop? *L. C. Penwill, Director E.C.A.*

High and Dry

A CUSTOMER complained that he had received a severe shock when using a portable drill in his brick-built, concrete-floored garage, a converted farm building some 30 yd from the roadway. It was a dry period and the floor appeared to be free from moisture.

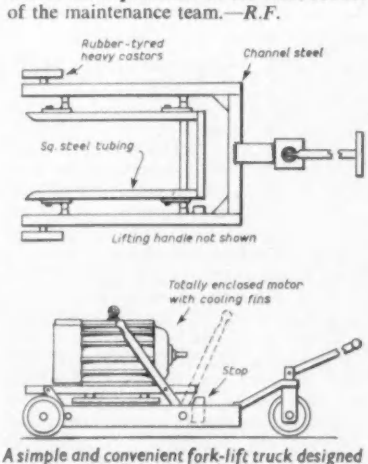
The garage was wired in t.r.s. cable and a 5 A, three-pin switch socket over the work bench had a 7/·029 earth wire run to a water tap, the pipe of which passed through the brick wall, where it terminated in a good quality earth clip soundly installed. The socket was protected on the live side by a 5 A fuse in a main switch serving this point.

Tests showed that the drill was properly connected to the three-pin plug, but that the armature had an earth fault—the obvious cause of the shock. A check at the socket gave no light with a test lamp between live and earth and a closer examination of the tap showed that there was no water flowing. The pipe had been hammered flat some distance below the tap to prevent, as the owner explained, the children playing with it. This seemed a reasonable explanation for no water, but the course of the pipe was traced around the building to where it entered the ground. Not satisfied, we dug down to find that it had been cut off about 3 in. below ground level. Had the ground been wet it might have functioned as a reasonable earth, but in the dry weather the resistance was high and it was useless, as the customer painfully discovered.—*S.R.F.*

Fork Lift for Motors

AS a maintenance engineer in a textile factory, I often had to transport 8 h.p. totally enclosed motors along gangways which were rather narrow and which did not allow much room for manoeuvring. Moreover, there was little room for working to fit or remove them from the bases which were low under the machines.

Fortunately, the motors were encircled by a number of robust cooling fins in the outer casing and I had a forklift truck made, as shown in the diagram, from stock steel sections welded together, which was designed to lift the motors by inserting the fork between the cooling fins. The motors were only secured to their bases on the machines by set pins and the operation of the lifting lever raised them clear ready for transfer on the truck to the maintenance bay. The effort to lift was small indeed and well within the capabilities of the least robust of the maintenance team.—*R.F.*



A simple and convenient fork-lift truck designed specially for finned enclosed motors

Electrode Boiler

I AM often surprised that the electrode boiler is not more extensively used in this country. There are, I know, certain precautions which have to be taken in installing them, but the normal drawback of current rise with temperature can be used as a simple and effective form of thermostat.

Some 30 years ago I was faced with the need to heat up several gallons of water fairly rapidly for certain purposes and I made a simple electrode boiler which ultimately saw service for nearly 20 years before being scrapped. The container was a large spun copper cylinder in the base of which was inserted two substantial porcelain insulators, one in the centre and the second offset. Two ¼ in. pipe connections were also inserted, one to admit water and the other for emptying. The central insulator supported an inverted conical electrode of iron and the offset insulator a hollow metal encircling electrode in the form of a funnel with a skirt round the upper edge, the slope of the funnel matching that of the cone so that the path between was parallel and adjustable in width by adjustment of the central electrode.

The live main was connected to the central electrode via a 25 A thermal-trip circuit-breaker, the outer electrode to the neutral and the case to earth. With the tank full—about eight gallons—and the current turned on, the initial load was about 8 A to 9 A, but, as the contents rose in temperature, the current increased to 25 A, when the breaker tripped. At this point the temperature of the contents was about 195°F, but it could be adjusted to other temperatures by altering the position of the central electrode.

Complete shrouding of the live electrode by the neutral prevented any leakage current from the live main to earth and the leakage between neutral and earth was only of the order of a few milliamp as measured. Gas evolved—a mixture of hydrogen and oxygen—was negligible in proportions and, of course, the "element" couldn't burn out if left on inadvertently. Circulation in the tank was extremely efficient and scaling troubles practically non-existent. Overall efficiency was surprisingly high at 96%.

Naturally, precautions have to be taken when making up such apparatus—it is not a job for an amateur electrician—but, when made, it can be efficient, cheap to construct and economical to run. And it is perfectly safe to operate.—*C. Jenkins.*

News of the Week

G.E.C. in Steam Set Alliance

Resources pooled with Richardsons, Westgarth

GENERAL Electric Co. and Richardsons, Westgarth and Co. have decided to pool their resources for the design, development, sale and manufacture of conventional power stations. While there is no financial tie-up, this is the closest working association at present between groups so far as steam-operated equipment is concerned, contrasting with the nuclear field where the consortium principle is highly developed. However, links between boiler firms have occurred recently, and AEI—C. A. Parsons—Reyrolle have agreed on joint research.

The two firms are not committed to operate together on any particular project, and their agreement will probably have its greatest effect in the export and industrial power spheres, where the sets are usually of smaller size than those ordered by the CEGB. The move appears to be well judged, for Lord Coleraine expressed the opinion recently that Britain might lose export orders worth millions of pounds if the purchasers of a power station continued to have to chase around among half a dozen firms for various components. GEC and RW are already associated in United Power Co. Ltd., the nuclear consortium, where RW's role is the manufacture of ancillary equipment while Simon-Carves make the specialised boilers. This set-up is not affected by the new agreement.

In a joint announcement last week, GEC and Richardsons, Westgarth said the object of the new arrangement is to increase their share of the home and export markets and make the maximum use of their combined technical resources and production facilities. The manufacture of all plant covered (steam turbines, turbo-type alternators, blowers, compressors and exhausters) will be shared and initially based on current GEC designs.

RW will concentrate on the design of industrial power plant with the object of supplementing existing GEC designs and widening the range of plant offered. At the same time RW will continue to sell and manufacture condensing and feed heating plant, rotary water strainers, evaporators and shell boilers of their own design and land water-tube boilers to Foster Wheeler design. The two companies, says the announcement, are therefore in a position jointly to build and equip, electrically and mechanically, complete modern power stations.

THREE NEW G.E.C. COMPANIES

A NEW subsidiary, the first of three, has been formed by GEC as part of a reorganisation following the acquisition of Radio & Allied (Holdings), makers of Sobell & McMichael radio and TV. The name of the new subsidiary is GEC (Radio & Television) Ltd., and it is understood that the others will be GEC (Home Products) Ltd. and GEC (Domestic Equipment) Ltd.

Both GEC (Radio & TV) and Radio & Allied will continue to operate independently with "separate and identifiable" products. However, there is a possibility that TV production may eventually be shifted from GEC's factory at Coventry and concentrated at Radio & Allied plants at Slough and Treforest.

Sales HQ of GEC (Radio & TV) will be at Slough, while service dept. will remain at Hammersmith. Simultaneously GEC are changing their "sales or return" conditions, eliminating radio sets.

Electric Cooker from Cannon

AN electric cooker is to be among the new appliances to be launched later this year by Cannon (EA) Ltd., the subsidiary of the gas appliance firm, we understand. There will also be a rotisserie grill and an electrical version of the firm's present combined gas cooker and refrigerator.

Bylock to service all makes

BYLOCK Electric Ltd. have established a nation-wide service network which will repair all makes of vacuum cleaners, refrigerators and washing machines. A new subsidiary, B.E. Service Facilities Ltd., has been set up to handle these activities which will be based on the half-dozen service depots, complete with engineering staff and spare parts, recently acquired from Vactric. These are at Glasgow, Sunderland, Doncaster, Manchester, Bristol and Birmingham. In addition, Bylock have transferred equipment from Vactric's former London service depot to their own Waltham Abbey service centre. Hitherto, Bylock service has mainly been carried out through agents, and these will continue to play a part.

E.T.U. Election Case

IF a branch of the Electrical Trades Union, having been warned once for any breach is disqualified for any other breach, that amounted to progressive disenfranchisement. In a period of years, far less than the foreseeable future, there would be no branches left in the union to vote unless there was a general forgiveness charter. That was the comment of Mr Justice Winn in the High Court last Friday, during the hearing of the action in which Mr J. T. Byrne and Mr F. Chapple seek a declaration that Mr Haxell's election as general secretary of the ETU was void, and ask for damages for conspiracy to secure the election of Communists or their sympathisers to union posts.

Mr Chapple, in evidence, said the Communist Party members of the union held meetings to decide on their plans before each policy conference and rules revision conference of the union. The hearing continues.

A.G.R. COMPLETION IN JULY

COMPLETION date for the prototype advanced gas-cooled reactor being built by the UKAEA at Windscale is now estimated as July. Labour troubles have caused considerable delay to the original programme for the reactor. At present, the graphite core and its supports are complete within the reactor vessel and the neutron shell has been erected. Fuel element failure detection pipes are being connected. One of the gas circulators has been successfully tested on a heat exchanger at design conditions of temperature and pressure and a second machine has been delivered to site.

Outside the reactor containment building, building construction is practically complete, and much of the turbine hall electrical plant installed and erection of the turbine well advanced.

HERO, the zero energy facility being built alongside AGR, is expected to be handed over for operations in the autumn of this year.

Good progress has been made with producing uranium oxide fuel pellets which will be used in the AGR fuel elements. Quantity production of components for those elements which will have stainless steel cans has begun and, despite difficulties with beryllium production and subsequent corrosion problems, a quantity of beryllium canned fuel elements is being produced. It is planned that up to 20% of the first charge for the reactor will be beryllium canned.

CHANGES IN CANADIAN APPROVALS

FACTORY inspection under the Canadian Standards Association approvals scheme is in future to be carried out in Britain by BSI/CSA agency. This is the result of a new agreement negotiated between CSA and BSI to succeed the 1950 agreement, which first enabled British manufacturers to obtain advice on, and approval of, all types of electrical equipments for export to Canada.

Until recently routine inspection procedures which follow initial approval of equipment and which include periodic visits to all licensees' factories have been operated under the control of the CSA's own district engineer in London. CSA have now shut down their district engineer's office and transferred the whole of the work to the BSI/CSA agency, which has operated from Hemel Hempstead for the past two years.

Announcing this development, BSI also state that Canadian manufacturers are becoming increasingly interested in the UK market. A start has been made on providing Canada with the same kind of service for British approval that is available in this country. It is hoped that, when appropriate, testing of Canadian equipment will be carried out in the CSA test house in Toronto, prior to shipment to the UK.

CSA approval is mandatory in Canada if electrical equipment is to be sold legally. The approvals code is one of the most stringent and comprehensive in existence.

More Electrical Appliances Approved

NINE shavers and one toaster have been granted approval by the British Electric Approvals Board for Domestic Appliances in the second group of the Board's test programme. The list also includes six radiant fires and six vacuum cleaners additional to those named in the 1 March list, set out below. BEAB is now willing to consider for approval radiant fires, kettles, vacuum cleaners, shavers, toasters, coffee percolators, wash boilers, hair dryers and irons.

APPROVED APPLIANCES

Fires: Herman Smith Ltd., Taywill Smithlite 2 kW "Wren," 3 kW "Albatross," 2 kW "Swallow," 3 kW "Eagle." Tack Industries Ltd. wall mounting 0·8 kW ref. Taylor and Wilson 2 kW Taywil "Robin."

Shavers: Morphy-Richards (Cray) Ltd., EBA and ECA 1. Philips Elec. Ltd., Philishave SC 7860. Pifco Ltd., Popular 1126, Prince 1127. Remington Elec. Shaver Ltd., "Roll-a-matic" BK and BKB. Ronson Products Ltd., Mark 3 C.F.L. Sunbeam Elec. Ltd., Shavemaster XSM.

Vacuum Cleaners: Goblin Ltd., G.61, G.72 and G.54. Hoover Ltd., 2944 and 2504/2614. Morphy-Richards (Cray) Ltd., CYL.

Toaster: Morphy-Richards (Cray) Ltd., Automatic TOS.

Lower Production of Small Motors

OUTPUT of the UK fractional horsepower motor industry fell by about £1·4 million to £13·5 million in 1960, according to the annual report of the Fractional Motor Conference. The fall was largely accounted for by the recession in the domestic appliances industry, the major customers.

The Conference, formed with BEAMA support two years ago, comprises AEI, Crompton Parkinson, English Electric, GEC and half a dozen other companies, accounting in all for about four-fifths of UK production. Members exported about 20% of their output last year.

U.S. POWER CONNECTION STUDY

TO study economic and technical aspects of inter-connected grids and power pool operation in America, an OEEC sponsored mission arrived in New York last week-end. Representing the UK are Sir Robertson King, chairman of the Electricity Council; Mr Ernest Long, member of the CEGB; Mr H. V. Pugh, chairman, Eastern Electricity Board; and Mr W. L. Parkinson, CEGB operation efficiency engineer. Mr J. Lewis of the Transmission Department of the CEGB is accompanying the mission as secretary. Altogether the party will be composed of some 26 individuals from 13 countries.

The visit is expected to cover 28 days, during which the party will have discussions at the Edison Electric Institute in New York and visit power pools.

Peebles—Belmos merger

BRUCE Peebles and Co. Ltd. propose to proceed with the merger with Belmos Co. referred to in our 5 Jan. issue. Mr T. Coughtrie, who is chairman of both companies, says details will be given as soon as available. Belmos, whose shares are not listed on London 'Change, specialise in mining switchgear.

Marconi Buys Factory from E.M.I.

MARCONI Wireless Telegraph Co., which is wholly owned by English Electric, has acquired the Wembley factory of EMI Electronics Ltd. The factory, which employs between 400 and 500 people, is being taken over as a staffed and equipped entity and will be used to meet expanding demand for electronic products in the Marconi range. Marconi declined to make any statement about personnel at the factory except that the changeover would be made with the minimum disruption and "prospects for the maximum production loading are good."

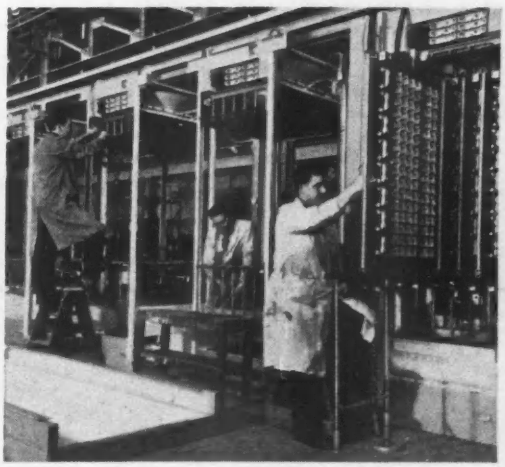
Ekco Heating Service

THE main Ekco Heating Service Department has been transferred from Somerton works, Westcliff-on-Sea, to Ekco works, Malmesbury, Wilts. Customers in London and S.E. England can send equipment for service to the London depot at Civic Hall, Exhibition Grounds, Wembley, from where there is daily transport to Malmesbury. In S.W. England, equipment can be sent direct to Malmesbury or the Bristol depot. Other areas will continue to be catered for by the depots at Birmingham, Manchester, Glasgow and Belfast. Servicing of "Warm-Glow" electric blankets will still be carried on from the Progress Rd, Leigh-on-Sea, service depot.

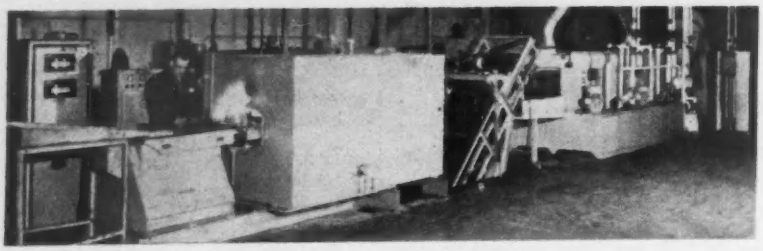
'Fridge Inquiry Postponed

THE public inquiry to consider whether imported refrigerator cabinets should be required to bear an indication of origin has been postponed. It will now be held at the BoT, Horse Guards Ave, S.W.1, on 29 May, at 10.30 a.m. It has been alleged that many imported refrigerators were being sold in the UK in a manner deliberately designed to convey the impression that they are British.

Plant for Norway



Rectifier equipment which AEI Rugby are making for extensions to an aluminium smelting plant in Norway is rated 108 MW and is believed to be the largest of its kind in the world. The picture shows a section of the 135,000 A 800 V d.c. semiconductor rectifier equipment in final stages of manufacture at the Rugby Works. This will soon follow the bulk of the apparatus, which has already been dispatched. Erection at Ardal og Sunndal Verk's site at the head of Sognefjord on the west coast, which is being supervised by AEI engineers, started early in March and is going well. Commercial operation, which will increase aluminium capacity by 32,000 tons a year, is due to begin in the autumn. AEI obtained the contract towards the end of 1959 in face of severe competition from the Continent



A 50 kW Efco shakerhearth furnace recently installed at the Redditch works of Herbert Terry and Sons, for increased production of springs. It has a hearth 18 in. wide, with a heated length of 5 ft, arranged in two independently controlled zones. The automatic washing machine was made by Electro-Chemical Engineering Co. A 12 in. wide furnace, rated at 20 kW, has also been installed

RIGHT TO CUT OFF SUPPLIES FOR NON-PAYMENT UPHELD

HAD the Eire Electricity Supply Board the right to cut off supplies to two premises owned by one individual who had failed to pay the bill in respect of one of them? That question was again raised last week when the Supreme Court in Dublin held that the Board, under its terms of agreement, had that power. The District Justice had earlier dismissed the action, but the plaintiff, Mrs D. Little, appealed. She claimed £50 damages, alleging breach of contract in depriving her of electricity at her Annagassan residence on 30 Sept., 1959. She also owned premises at Dundalk which had been unoccupied for some years. On 26 Nov., 1958, she failed to pay the electricity account for both premises, but the following day paid the accounts, plus reconnection charges. She had been away when the supply was cut off, returning late in the evening, and had to stay in an hotel overnight for which she claimed expenses incurred. That claim had never been admitted or paid by the Board, or abandoned by Mrs Little.

Until August, 1959, separate accounts had been submitted for electricity consumption at each of the premises, but then the Board supplied one account for the two premises. Mrs Little set apart the Dundalk amount claimed and paid only the Annagassan account. Supply to the latter premises was cut off on 30 Sept., 1959, although it was agreed that no sum was owing for electricity consumption there. But there were £2 8s 1d arrears for the Dundalk premises, the Board claimed.

Without expressing an opinion as to whether or not the provisions of the contract were exercised harshly, Mr Justice Lavery upheld the Board's action and the case was sent back to the Circuit Court judge.

Engineering Exhibition

THE Machine section of the article "Engineering on Display," ELECTRICAL TIMES, 20 April, referred to an AEI Motor and Control Gear Division, 300 kW high-frequency motor alternator unit. The frequency for this output was stated to be 123 kc/s, it should have been 1 kc/s to 3 kc/s.

Engineers on the Railways

CRITICISMS of the small number of professional engineers employed by railways were a feature of a Parliamentary report last year. In a document published by HMSO last week, the BTC reply is noted. BTC say that in the last four years they have increased their technical staff by one-third "though the proportion of qualified mechanical, electrical and signal engineers has fallen."

Existing schemes for graduate engineers and sandwich schemes for mechanical engineers and signal engineers are thought to be showing promise, but these schemes are not sufficient to counteract shortages; and there are proposals for recruiting more university graduates.

The Commission says that although they have no formal scholarship scheme, it is paying the salaries of nearly 100 young railway men who are taking whole time or sandwich courses of the provisional level.

Influx of Orders

A PHASE of increased capital investment by UK industrialists is beginning to show up in the order books of firms making engineering and electrical goods. The flow of new orders, having gathered pace in January, accelerated sharply in February. Provisional estimates of the BoT show net new orders up by almost 20% in February, with the whole of the increase attributable to the home market. Orders on hand at the end of the month were about 4% higher than at the beginning of the year and stood at the highest level for at least a year. Brighter prospects in the motor and consumer durables industries, as well as the expansion plans of steel and chemical producers, are contributory factors.

PAYROLL TAX FLEXIBILITY

THE Government will have powers to vary its rate of payroll tax from one type of employee to another, if the tax is brought into effect. This is made clear in the Finance Bill, published last week, which says that different rates of surcharge (as it calls the tax) may be prescribed for different descriptions of persons with full exemption in some cases. "Description" in this case is related to classifications under the National Insurance Act.

The Bill contains powers for introducing the 10% surcharge or rebate on purchase tax and customs and excise duties. This would apply to the fuel oil duty, amongst other duties.

OFFICIAL PUBLICATIONS

Finance Bill. HMSO. 2s (see this page).

ERA annual report, 1960 (see page 714).

Report from Select Committee on Nationalised Industries: British Railways (observations of BTC and MoT). HMSO. 1s (see this page).

BS 3347. Capacitors for railway signalling track circuits. 4s.

BS 2258. Shields for electronic tubes and valves. Part 1. General requirements and tests. 5s.

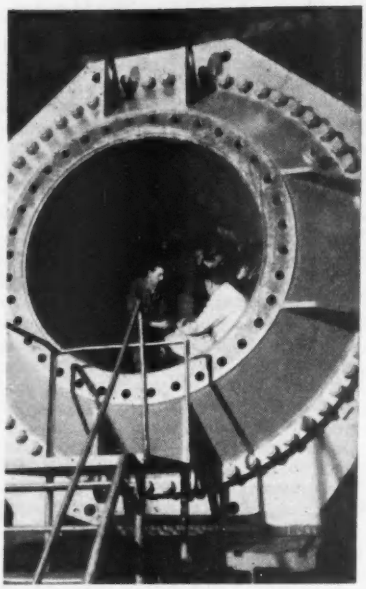
Spain: A challenge and an opportunity. Report of trade mission. FBI. 7s 6d.

The Engineering Industries in Europe, 1960. OEEC Report. 10s 6d.

ERA publications:
D/T116. Intrinsically Safe Electrical Apparatus. Relation of Igniting Current to Circuit Inductance for a Mixture of Ethylene Oxide with Air, P. B. Smith and N. L. Heathcote, 4s 6d; D/T117. Flameproof Enclosures. Re-Determination with Hydrogen/Air Mixtures of Maximum Safe Gap for One-Inch Flanges, P. B. Smith and J. R. Blackwell, 6s; D/T119. Intrinsically Safe Electrical Apparatus. Relation of Igniting Current to Circuit Inductance for a Mixture with Air of the Vapour of (1) Methyl Acetate, and (2) Acetaldehyde, D. H. Jones and N. L. Heathcote, 6s.

Swedish Trade Fair

IN conjunction with the Export Council for Europe, the FBI are organising a Trade Fair in Stockholm in 1962, which will cover all aspects of British exports. The fair will have the strong backing of the Board of Trade, who are concerned at the decline in British exports to Sweden which has recently been apparent. An indoor area of 100,000 sq ft will be available for display, with a further 175,000 sq ft outdoors. The fair is being organised by British Overseas Fairs Ltd. and will be open from 18 May to 3 June.



The first of four 5½ ft dia. pump discharge valves ready for despatch from the English Electric Co's Netherton works to the Ffestiniog pumped storage scheme, N. Wales. E.E. are also supplying four 105,000 h.p. water turbines for the scheme

LARGEST ELECTRODE BOILER?

BASTIAN and Allen Ltd. have received an order for what is believed to be the largest electrode hot water boiler ever manufactured. It will be rated at 18,000 kW, operating at 13·2 kV, with an output of 60 million B.Th.U's under a working pressure of 350 p.s.i. and delivering water at 380°F.

The boiler has been ordered through their Montreal agents, Modenco of Canada Ltd., and is for the Iron Ore Co. of Canada at their Carol Lake project in Newfoundland. It will be used for a high pressure hot-water heating scheme for the many buildings at this mine. Current will be supplied by Quebec Hydro Power and will save the transportation of oil to the mine.

E.R.A. WANTS CONTRACT WORK

WILLINGNESS of the ERA to undertake research and testing for members and non-members alike on a contract basis is stressed in the April issue of the ERA house journal, *Co-operative Electrical Research*. It is said that terms will be negotiated with reference to whether the firm wanting work done is a member, and whether the work is of a research or a test nature.

The ERA have also announced two new programmes of research. One concerns surge propagation characteristics of power cables, and has been started with the object of assessing the need for lightning protection of cables connected to overhead lines, and also the protective effect afforded by cables. Tests are being made on installed cables, with the co-operation of the Southern EB. The other work concerns the assessment of the frequency with which over-voltage transients arise on l.v. supply systems.

Articles on ERA circuit-breaker work, on sphere gaps in h.v. measurements and on ERA research into h.v. d.c. are included in the issue, along with a report on a member's recent visit to India.

FOR INVESTING FUNDS?

WITH the title of Electricity Supply Nominees Ltd., a new company limited by guarantee, without share capital, has just been registered and its directors are to be appointed by the Electricity Council. The income and property of the company is to be applied solely towards the promotion of its objects. It is understood to be solely an investment vehicle, to enable the Electricity Council to invest some of the industry's superannuation funds in "equity" stock as will be permitted when the Trustee Investments Bill is put into effect very shortly. This legislation will allow up to 50% of a trust fund to be so invested. In the registration of Electricity Supply Nominees Ltd., those named as subscribers are: Sir Robertson King, Sir Josiah Eccles, Mr R. S. Edwards, Mr C. T. Melling, Mr R. A. Finn, Mr A. M. Scott, Mr W. B. Noddings and Mr R. D. V. Roberts.

Trends in Heavy Electrical Exports

THE broad picture of UK's export trends for heavy electrical equipment indicated by GEC's quarterly Export Guide is one of rising exports to the highly developed countries of Western Europe, and falling exports to North America and some under-developed countries. Where exports are falling, the reason is usually a decline in demand rather than displacement by a competitor, but in the case of India, an upsurge in local production is the key. Lower commodity prices and their contingent balance of payments problems are no doubt behind the decline in demand in some primary producing countries; Ceylon, which recently applied more stringent import restrictions, is an outstanding example of this situation.

West Germany remains our principal competitor despite the revaluation of the Mark. In Belgium, Germany is increasing her share of the generator, motor and transformer market at UK's expense, but the reverse applies in Pakistan.

One quite marked tendency is for US exports to decline, particularly in the politically troubled Caribbean area. A downturn in US production of heavy electrical goods is also indicated, whereas West Germany's continues to rise.

Competition Rife in West Country

A DECIDEDLY competitive air has prevailed on both sides of the counter in South Western EB service centres during the past few days. Simultaneously with a Refrigerator Fair competition, with a £150 all-electric kitchen as first prize for the lucky consumer, the Board are conducting their annual service centre display competitions. Over 100 service centres are competing for either the Frank Forrest Silver Trophy or in a separate section for smaller centres. All of the competitions will be judged by the end of this week.

TWO NEW B.E.A.M.A. SECTIONS

TWO new sections have been formed by BEAMA—the Industrial Electronic Equipment Section and the Nuclear Reactor Section. In addition to the day-to-day work relating to technical matters, standardisation, exports and statistics, the Industrial Electronic Equipment Section will also provide a means of closer discussion with other associations and help towards the wider examination of general policy questions affecting that industry. Chairman of the section is Mr W. Gregson, of Ferranti Ltd., with Mr R. J. F. Howard, of Metal Industries Ltd., as vice-chairman.

The Nuclear Reactor Section is to be concerned with reactors for electrical power applications, and membership is open to all BEAMA members who, as participants in groups or consortia concerned with the design and building of nuclear power reactors, undertake contractional responsibility for their operation. Present members are: AEI, English Electric, GEC, C. A. Parsons and Babcock and Wilcox; secretary of the section is Mr G. T. H. Spurling.

Major G. Boyce, RDC chairman, switching on the lights to mark the opening of a new EEB showroom at Amersham. Major Boyce praised the CEGB for its consultations on sites for pylons and said the siting was better than in other countries

A section of the new London showroom of Remploy Ltd., opened at 22 Bruton Street, W.1, last week

POWER SUPPLY IN MARCH

WE regret an error occurred in Power Supply Statistics for March, in last week's issue with reference to the South of Scotland Electricity Board. Electricity sent out for the month was 792·7 million units, an increase of 4·9%, and not the published figure of 597·5 million units with 2% decrease. The monthly and cumulative sales shown on the "Electricity Board Sales" graph should have been 4·9% and 7·8%, respectively.

Imports from Bulgaria and Hungary

A NUMBER of electrical items are included in new trade agreements with Bulgaria and Hungary recently completed by the UK Government covering imports and exports during the year ending 31 March, 1962. Of the goods which may be imported into the UK from Bulgaria during the period, the items and their quotas include: electric motors (£20,000), power transformers (£20,000), accumulators (£20,000), porcelain insulators (£20,000), and plastics insulators (£5,000). Under a reciprocal arrangement, the quota of goods to be imported into Bulgaria from the UK includes electric lighting carbons (£2,000), carbon blocks and brushes (£2,000), radio, radar, television and telegraph communication equipment and TV receivers up to an estimated total value of £200,000, plus certain classes of industrial machinery, including electric lamp making machines.

The provisions of a similar arrangement concluded with Hungary include the import from the latter country by the UK of incandescent lamps and fluorescent tubes to a value of £20,000, radio valves (not transistors) up to £95,000, and domestic electric appliances including coffee-making machines (£50,000). Quotas of goods to be imported from the UK by Hungary include £3,000 for electric light fittings, £50,000 for electronic valves, £35,000 for radio and TV sets, components and radiograms, £10,000 for other electronic equipment, £30,000 for glass bulbs for electric lamps, c.r.t's or electronic valves, and £65,000 for miscellaneous metal goods, including domestic electrical appliances. Telephone, television and telegraph equipment is also to be imported.

Research into Physics

BRITAIN's annual expenditure on basic physical research is probably £7 million a year, estimated Sir John Cockcroft in the first presidential address to the Institute of Physics and the Physical Society, delivered on Tuesday. He thought this expenditure would need to be doubled over the next ten years, and that it was essential for the nation's future development.

Speaking of last year's amalgamation of the Institute of Physics and the Physical Society, Sir John suggested that the time had come for a change in title. Total membership of the combined body was now approaching 10,000 with the rate of growth of about 8% per annum.

TENSOR CLUB DINNER

THE University of Nottingham last Thursday awarded an Honorary D.Sc. to Gabriel Kron in recognition of his work on the application of tensor theory to the study of electrical machines. Dr Kron, who is with the General Electric Co. of America, is patron of the Tensor Club of Great Britain, and, to celebrate the occasion, the club entertained him to dinner. To the ordinary engineer, tensors are something of a mystery and the higher flights of philosophical mathematics involved in Dr Kron's current investigations foxed even some members of the Tensor Club. Nevertheless his enormous energy, enthusiasm and flood of words would have made the occasion memorable even without the liberal use of such pithy comments as "I was not a mathematician, I was just a stupid 60 cycle engineer" or "developments in power engineering stopped with symmetrical components in 1918." Dr Kron's current work is concerned with developing a unified concept for multi-dimensional networks with applications in, for example, the theory of magnetohydrodynamics.

G.E. Chiefs Deny Knowledge of Price Ring

THE battle by the major US electrical manufacturers to avoid heavy damages payments to the victims of their price-fixing conspiracy has begun. The manufacturers are basing their hopes on the contention that their senior officials knew nothing of the practice. The vice-president of General Electric, Mr A. Vinson, swore before a Congressional inquiry last week that he knew nothing of the price ring, but four of his subordinates swore that he did. One of these witnesses, Mr G. Burens, a former division manager, said that Mr Vinson had ordered him to attend price-fixing meetings with competitors.

The Congressional inquiry will presumably be instrumental in determining how far the Government will pursue its own large claims for alleged overcharging, and supply authorities throughout the country will probably take their lead from the Federal Government, so the inquiry is of vital importance.

German Women visit London

THREE leading officials from West Germany's largest and most influential women's organisation — the German Housewives' Association — have been spending a week in London as guests of EDA and the Electrical Association for Women to study electrical housecraft in Britain. Their programme included a visit to the EDA Testing House at Leatherhead, and the EAW annual conference. This follows the visit to Germany last September of Miss Mary George, of EAW and Miss Mary Gilbert, of EDA.

Mexborough to rent 'fridges

APPROVING the recommendation of the treasurer, Mexborough Urban Council have decided to order 250 refrigerators immediately from the Yorkshire Electricity Board for hiring to Council house tenants at a rental of 2s 6d a week for a period of 11 years. After that period, the rental will be reviewed. The housing manager is to circularise tenants to ascertain the demand for these refrigerators and provide the YEB with a list of dwellings.

Mr J. I. Bernard, director of EDA, welcomes the visitors from Germany at a luncheon

LARGE CONTRACTS

A £90,000 contract for busbar trunking for the new plant of the Ford Motor Co. Ltd. at Haleswood, Lancs, has been awarded to the Power Centre Co. Ltd. Equipment to be supplied consists of some 20,000 ft of 1,200 A t.p. and n. metalclad busbar trunking for the power services feed in the assembly buildings and press shop at the new factory.

FILM Cooling Towers (1925) Ltd. have won a £1¼ million contract for the construction of six large natural draught cooling towers for Drakelow "C" power station. The contract will be carried out in partnership with J. L. Kier and Co.

New Substation in North Worthing

A 33/11 kV substation being erected by South Eastern EB on a wooded triangular site at Offington Corner, Worthing, will be placed in service in time for next autumn's rise in load. Standing in a purely residential area, the substation has been designed not to clash with the detached houses nearby. Appearance will be improved and noise lessened by a high brick wall on three sides of the two transformers, with a fence on the fourth side. Eventually the installation will be screened by trees which will be planted to replace those felled on the site.

The new substation will be linked to the grid at Ham Bridge substation, 2¼ miles away, by two 33 kV oil-filled cables which AEI are at present laying through the Worthing suburbs.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, May 2

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	235½	+5½
" (3 months)	236½	+4½
LEAD, refined pig, 99·97% purity (cash)	67½	−½
" (3 months)	68⅜	−⅜
TIN, refined, min. 99·75% purity (settlement)	841½	−1½
(3 months)	848	−4
ALUMINIUM, ingots 99·99-99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	204½	+3
SILVER (Troy oz)	79½d	—
ZINC, virgin, min. 98% purity (cash)	83½	−⅛
" (3 months)	83½	−⅛
RUBBER, per lb. No. 1, RSS, spot	27½d	−⅛d
c.i.f. basis, ports, July	27d	—
ARMOURING: Galv. Steel Wire (0·104 in.)	67½	+1
Mild Steel Tape (0·04 in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	67	—
AMERICAN PRICES: Copper, electrolytic (per lb)	30c	+1c
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

IMPRESSIONS OF JAPAN

WITH the new president, Mr W. N. C. Clinch, installed and Messrs H. E. Fleetham and J. C. Robertson signed on as mate and assistant mate for another year, the Batti Wallahs settled back last week at their monthly luncheon to hear some impressions of Japan, given by Dr H. K. Cameron, B.SC., technical director, United Power Co. Referring to the Japanese power programme, he said electrical demand was growing at a tremendous rate and last year attained 17%. A total of 7,000 MW of nuclear generation alone was planned by 1975. Stations had to be designed to meet the frequent earthquake tremors experienced in the country and, although the severest acceleration recorded was 0·1 g, the GEC station at Tokai Mura was designed to withstand accelerations of 0·4 g. Japan had 40 public utility companies and interconnection was complicated by a dual frequency system, 60 c/s in the north and 50 c/s in the south. Until the second world war, generation had been principally by hydro power, but dwindling resources had forced thermal generation to a position of equality, even though fuel was expensive. Dr Cameron commented on the tremendous industry of the Japanese. It would be wrong, he said, to continue to regard them merely as good mimics. They were pre-eminent in carbon technology and had contributed much originality to engineering design.

The next meeting will be held on 31 May at the Connaught Rooms, when Mrs Dunsheath will describe "Experiences with Russians in the Caucasus." The new committee comprises Messrs J. B. Scott, G. H. L. Smith, M. D. Cloran, P. Calderera, H. A. Crabtree and T. C. F. Bigland.

TAX ON KNOW-HOW: CASE GOES TO LORDS

THE Court of Appeal last week reversed an earlier decision concerning the liability for income tax on lump sum payments made by foreign Governments or companies for the acquisition of British technical know-how. The Inland Revenue Commissioners were appealing against the High Court ruling (reported in our 2 June, 1960, issue) that Rolls-Royce Ltd. should not be assessed for tax on the sale of technical knowledge. The assessments amounted to over £15 million for the years 1948-55, involving some £500,000 income tax.

Rolls-Royce contended that knowledge and secret information they acquired was a fixed capital asset. The Crown maintained that the lump sums were received in the normal course of trade. Giving judgment last week, Lord Justice Holroyd Peace held that so far as the lump sums were paid in respect of imparting knowledge they were sums regularly received as an ingredient of the company's policy of making manufacturing agreements to secure royalty revenue. To such agreements the disclosing of technical knowledge was a necessary adjunct, and he considered that the sums were part of the annual profit from the company's trade. Lord Justice Upjohn and Lord Justice Donovan delivered concurring judgments, and agreed to grant leave to appeal to the House of Lords.

Sayings OF THE WEEK

"In the context of the recent growth of manufactured goods a number of people have advocated a return to import controls. I believe that such a policy would be wholly contrary to our main trading interests." . . . RT HON REGINALD MAUDLING, President, Board of Trade, speaking at Southampton.

"A great many of the kitchens were planned to break a woman's heart as well as her back. They were designed by men. If one could only bring them back and sentence them to 18 months' hard labour in their kitchens they would soon redesign them as well as a ship's galley." . . . MISS B. NAISH, home safety manager, RoSPA, at the Royal Society of Health congress.

"Factories will be largely automated by systems of control, expansion and design which will replace both the black-coated worker and the blue-overalled worker with the white-coated worker." . . . VISCOUNT HAILSHAM, foreseeing things in 1984.

News in Brief

The Coil Spring Federation and its research organisation are holding their annual conference at the Palace Hotel, Torquay, from 11 May to 14 May.

Members of the London Graduate and Student Section of the IEE recently visited the International and Continental telephone exchanges in London, and the Leatherhead laboratories of the ERA.

Nearly 100 directors, executives, foremen and staff of Oldham and Son Ltd. attended a private conference at Grange-over-Sands last week-end.

Eastern EB's training school at Hatfield is to be extended at a cost of £90,000.

National Institute for the Deaf now offer to test free any type of hearing aid for the public.

The 2d a gallon tax on heavy oils will add about £30,000 a year to the cost of producing electricity in the Isle of Man.

The Scottish section of the Electrical Wholesalers' Federation has won the EIBA Silver Rosebowl for the highest average collection per member.

OVERSEAS NEWS

from our correspondents abroad

CANADA

New Brunswick Survey

A preliminary survey for a possible hydro-electric scheme at Mactaquac, some ten miles west of Fredericton, on the St. John River, has just been concluded by a team from the New Brunswick Electric Power Commission. The survey included test borings on both river banks and, from results, it is judged that the site has a potential of up to 500,000 h.p.—considerably more than at the Beechwood project where installed capacity will be raised to 135,000 h.p. when the third machine is completed. The Mactaquac tests are part of a programme of compiling an inventory of the power potential of the province, including the complete development of the St. John River. But officials of the Commission have emphasised that these may be very distant projects—another thermal station at an unannounced location is expected to have prior position in the future power programme.

Utility's Profit Increase

Profits of the Southern Canada Power Co. rose by nearly 2½% for the year ending 31 Dec., 1960, to $1·93 million. Gross earnings were also up from $13·3 million to $14·22 million, an increase of 7%. During the year under review, the company invested nearly $2·5 million in new plant and equipment.

Calgary Power Sales Rise

The consolidated net profit of Calgary Power Ltd. rose by 11·6% to $6·25 million during 1960. Gross revenue increased by 10% to $25·7 million. Electricity demand also rose during the year by 10·1% to 2,035 million kWh, although this was less than the 16·7% increase during the previous year. The company, under an agreement with the province of Alberta, is to construct initial storage works on the Brazeau power project, which is expected to generate eventually 550 MW. The initial 150 MW stage is expected to cost $25 million and is unlikely to be needed before 1964. Work on the 150 MW thermal station at Wabamun is well advanced, and this year a 183 mile 240 kV transmission line from Wabamun to Calgary is to be constructed, at a cost of $6·5 million, for completion in 1962.

Canadian Water Power

The water power resources developed in Canada to the end of 1960 totalled 46 million h.p. under conditions of low stream flow and over 66 million h.p. at average flow. This information is given in the bulletin: "Water Power Resources of Canada" by the Water Resources Branch of the Dept. of Northern Affairs and National Resources. Last year a total of 1,741,820 h.p. of new plant was installed and construction at present in progress should add a further 243,000 h.p. this year. Other schemes now under construction or development will contribute an additional 5·5 million h.p. over the next few years. At the end of 1960 the installed capacity of hydro-electric and hydraulic stations in Canada totalled 26,375,444 h.p., of which nearly 12·5 million h.p. was in Quebec province alone. The horsepower installed, of which about 77% is owned by utilities, and the remainder by industry, represents 1,481 h.p./thousand of population. In terms of coal, electricity generated by water power during 1960, 105,774 million kWh, was equivalent to burning nearly twice the 23·6 million tons of coal actually consumed by Canada last year.

TRINIDAD & TOBAGO

Expansion Planned

The Trinidad and Tobago Electricity Commission is envisaging finance from the World Bank in a $45 million plan for providing a supply to Tobago and for the general electrification plan. The Bank earlier agreed in principle to provide a loan of around $20 million, subject to an amendment to the Trinidad and Tobago Electricity Commission Ordinance. Discussing the matter in the Legislature recently, the Premier, Dr. Williams, said the Cabinet agreed last July that the Commission's generating plant should be expanded by the addition of two turbo-alternators—the first about the middle of 1963 and the second around the end of 1965. That represented an expansion of the original idea. The proposal now included the laying of a submarine cable between Trinidad and Tobago to supply electricity to the latter island at cheaper rates than are now available and the utilisation of natural gas in electricity generation at the Port of Spain as well as at Penal.

ARGENTINA

Station Hold-up

Delayed by lack of funds for the payment of the civil engineering contractors, the new 600 MW South Dock power station, being built in the Buenos Aires district, is making but slow progress, the Minister of Economy has just reported. He has blamed the former Government authorities for undertaking the scheme without making adequate financing arrangements, with the result that whereas it was originally said to cost 2,000 million pesos, that figure has now risen to about 17,000 million. Originally the station was planned to have the first of five 120 MW sets in operation in 1960, but it is now hoped that this machine will be running by the end of 1962. The order for the station was placed by the Argentine Government in 1957 with the BTH Co. and International Combustion (Export) Ltd., with Merz and McLellan acting as consultants for plant layout and technical co-ordination, and Sir William Halcrow and Partners for the civil work. In Argentine official circles it is now considered that the only hope for satisfactory completion of the project would be to transfer it to private ownership, and despite political opposition, the Government is trying to make this arrangement, we understand.

S. AFRICA

Winder Order

A repeat order, valued at over £50,000, for equipment to be used in the conversion of a winder from steam to electric drive, has been placed with the General Electric Co. Ltd. by the East Rand Engineering Co., of Johannesburg. As in the case of the previous order this converted winder will be installed underground at the Withok mine of the SA Lands and Exploration Co. Ltd., of the Anglo-American Corporation Ltd. Twin 6·6 kV 1,150 h.p. ten-pole a.c. motors will be used to drive the 12 ft by 5 ft double-drum winder which will be fitted with GEC's latest closed-loop a.c. speed-control equipment. A six-panel h.v. switchboard and a liquid controller is included in the order.

PAKISTAN

Hydro Project for Chittagong

Plans for the construction of an Rs10 crore hydro-electric station with an installed capacity of 30 MW have been finalised by the East Pakistan WAPDA. The station will be built on the River Sangu about 65 miles from Chittagong. A commencement date for the scheme has not yet been decided, but completion is expected in early 1966.

Fluorescent Project

Two Japanese firms are organising a joint venture with Pakistani interests in the production of fluorescent lamps in West Pakistan. Of the Rs600,000 capital of the new company, 60% is to be provided by the Humayan Co., of Pakistan, and 40% by Nichimen Jitsugyo and the Imoto Electric Co., of Japan.

INDIA

Electrification Tender

Global tenders are shortly to be sought for the electrification of the Tambaram -Villupuram section of India's Southern Railway. Estimated to cost Rs3¼ crore, the scheme envisages the extension of the present Madras-Tambaram line to a further distance of about 82 miles up to Villupuram with the 25 kV a.c. system. The locomotives have already been ordered to be made at the Chittaranjan workshop. The project is expected to be completed before the end of the third Five-year Plan.

Fourfold Power Increase

Because industrial progress had been hampered by insufficient production of electrical power, the Uttar Pradesh Government plans to increase power potential four times during the Third Plan period. This was stated recently by the Chief Minister, Mr C. B. Gupta.

Delhi and Calcutta Power Crises

Large-scale power failures seriously dislocated industry in the cities of Delhi and Calcutta last month. In Delhi, power cuts imposed by a water shortage early in the month were aggravated by a breakdown of transmission from the 24 MW Nangal station. The breakdown was caused by a 70 m.p.h. gale which felled no less than 15 transmission towers over a distance of 3·5 miles. The disruption of supply in New Delhi has affected industrial production, and was worsened by a lack of response from the general public to requests by the electricity authorities to use less power.

In Calcutta, estimates put loss of industrial production at between 15% and 20%, due to successive breakdowns in electricity supply. Lack of sufficient maintenance to meet the heavy loading that has been required on the local generating plant is blamed for this succession of failures. One of the plants which was out of service for repair was a 50 MW unit at Cossipore. Several industrialists have expressed their concern over the Third Plan proposals for expansion in the Calcutta district and similar concern has been echoed by others in Madras, Punjab and Delhi. Recently it was stated that slight improvement to the Calcutta supply might be possible by transferring power from Sindri, Hindustan Steel Co. and additional power fom the DVC to the city. It was also stated in Lok Sabha recently that under the Third Plan, Calcutta had been allotted Rs10 crore of central funds for power development in the city and a similar sum for development in the State.

Diesel Generators in Gujarat

To meet the urgent power demand, the Government of Gujarat is to construct 12 diesel generating stations. Existing stations are running at maximum capacity and at a recent conference it was stated that the system may break down completely if further stations are not constructed.

Soviet Aid?

The Soviet Government is understood to have agreed to supply machinery and technical personnel for the installation of the right bank power house of India's Bhakra project.

An advance party of Russian experts is expected to visit the site shortly for a preliminary survey. The project is estimated to cost Rs35 crore. Soviet assistance is likely to be to the extent of Rs8 crore. The power house will have four 120 MW sets with provision for the addition of a fifth machine at a later date.

Power Survey in Madhya Pradesh

The Government of Madhya Pradesh has decided to survey the irrigation and power potential of the State. This was recently stated by the Minister for Irrigation who added that, because of their use by adjoining States, failure to carry out such a survey might jeopardise the use of rivers flowing through Madhya Pradesh. The resources of the Narbada, Barni, Hasdeo and Parvati rivers would be investigated. He also said experts had suggested that the Narbada Valley Corporation should be continued and that construction of three more thermal stations on the Narbada River would make available more than 1,000 MW. The Minister for Electricity also said recently that the output of the Gandhi Sagar dam was being fully utilised. The 40 MW scheme is a joint venture of Madhya Pradesh and Rajasthan. For full exploitation of the Chambal power project an investment of Rs20 crore was envisaged, for utilisation of 15 MW by medium and heavy industries, and a further Rs3 crore for 10 MW by small industries.

AUSTRALIA

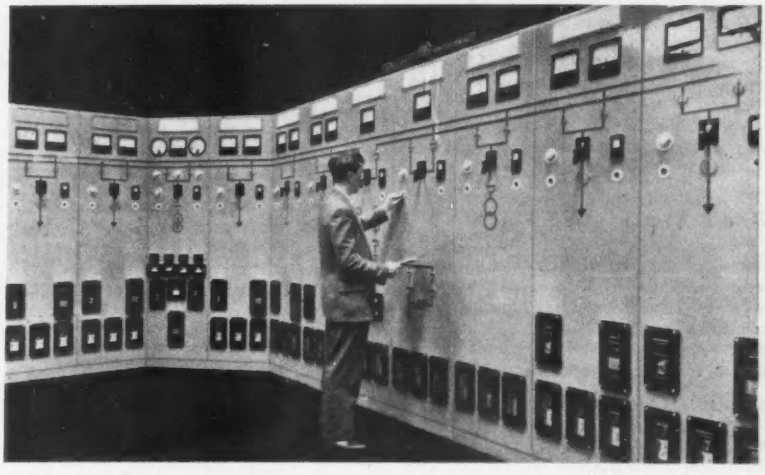
Northern Rivers' Need

Having stopped exploratory drilling for coal in its area, because of the disappointing results, the Northern Rivers' County Council, New South Wales, is now considering the next step in a plan for a new power station. The State would prefer a large generating station between the Muswellbrook coalfield, NSW, and the Queensland border, with the Clarence River Valley being a logical position. But failure to find good coal reserves restores the possibility of utilising the hydro-electric resources of the Clarence Valley. The Northern Rivers CC, has a bulk supply arrangement with the Electricity Commission of NSW (from which 1,039,400 units were purchased in 1960), and the Council is committed to take marginal supplies from the Commission through an interconnection to be ready by March, 1963. The Council does not anticipate difficulty in meeting the 1962 winter load from its present generating stations at Koolkhan, Nymboida and Lismore, which, together, generated over 166 million units last year. Mr S. D. Berry, chief electrical engineer, reports that unit sales in 1960 increased by 5·11%, operations for the year resulting in a net surplus of £50,606.

Gas Power House

Australia's first power house to generate electricity from natural gas is now operating at Roma, in south western Queensland. Production began last month when the Queensland Governor, Sir Henry Abel Smith, turned a valve at the Roma power house to feed an oil-gas engine of 1,000 h.p. The gas is being piped one mile from a bore on the outskirts of the town. The project is on trial for 12 months.

CONTROL BOARD FOR KUWAIT



Part of a 15-panel control board, recently completed by South Wales Switchgear Ltd., at their Blackwood, Mon, factory as part of a contract for the Kuwait Government. The company is also building a number of switchboards under the contract. The board illustrated was designed for the control of one of them—a 15-panel duplicate busbar, air insulated, metalclad switchboard, incorporating solenoid-operated oil circuit-breakers with a breaking capacity of 500 MVA at 11 kV

Company Activities

DESPITE the accumulating evidence of the squeeze on industrial profit margins and the cautious tenor of boardroom statements, the stock market boom rides bravely on. The Algerian revolt which in the old days would have tommy-gunned the bottom out of the market did no more last week than persuade operators to stroll about their business rather than scramble, while de Gaulle's later *jour de gloire* against "les Paras" was the signal in London—and, indeed, on most European bourses—for fresh uprisings of a financial nature. Thus, the *Financial Times* industrial ordinary index finished the week at a new all-time peak of 362·8.

Initial market reaction to the London dock strike was almost to disregard it, but in view of the immense volume of goods shipped out through the Port and the real harm that results not only in the loss of overseas confidence but, also, in actual orders, a rash of labour troubles in this vital sector could cause a set-back in the stock market.

But if most equity sections of the stock market were buoyant last week this was not generally the case with electrical shares. A contributory factor here was the full report from Mr H. H. Mullens, chairman of C. A. Parsons and Co., the Newcastle turbine, transformer and electrical machinery people. Three weeks ago the company's £1 Ordinary shares soared from 61s 6d to 70s 3d on the rise in 1960 trading profits from £3,399,169 to £5,005,434 and on the dividend step-up from 1s 10½d a share to 2s 6d.

Now, says Mr Mullens, although profits for 1961 should be at a fairly high level, thereafter lower profits must be expected. As in 1959, the level of orders taken for turbo-generators last year was low. Some parts of the factory are already working well below maximum capacity and by the end of this year more departments will be affected, and this is in spite of the very substantial orders received from the CEGB since the financial year ended in December. Once again, it is the old story of world-wide excess of manufacturing capacity for turbo-generators and transformers. Recent estimates, too, suggest something like four years before the UK's present capacity in these fields is fully utilised by incoming demand. So down dropped the Parsons shares from 72s 9d at the start of the week to 67s 3d by the close.

GEC, now with only 25% of its activities in heavy electrical engineering, also showed a negative charge at 36s, down 1s 3d. News that GEC and Richardsons Westgarth are to pool their resources for the design, development, sale and manufacture of heavy generating and industrial power plant, brought little support for the share price of either company, although the 10s Ordinaries of Richardsons did manage a 1½d rise to 8s.—*From our City Correspondent.*

Aberdare Holdings

The rate of increase in turnover of South Wales Switchgear, the largest subsidiary, was well maintained in the year to 31 Oct., and was largely responsible for the satisfactory group result, the chairman, Sir John Pascoe, states in his annual review. Aberdare Cables, which accounts for about a third of group sales, maintained turnover reasonably well but at "unremunerative" prices. Nevertheless, a profit was made on cables and at present slightly higher prices are being obtained on improved turnover. The range of transformers has been considerably increased and the loss of turnover due to flood damage at the factory at Treforest Estate quickly made up.

Bylock Electric

"Difficulties of trading and liquidity continue" the chairman told shareholders, who must now have some misgivings in view of last year's loss. However, the company has launched a new nation-wide appliance service venture with depots recently acquired from Vactric.

Chloride Electrical Storage

The chairman expects a steady growth in opportunities, though the pressure on margins apparent last year is likely to continue. With the recession in the motor trade, 1960 was a year of "great fluctuations" at home, but sales of traction batteries were particularly heavy.

T. Clarke

A one-for-two scrip issue is proposed and higher profits indicate that directors' expectations of the benefit to be obtained from the acquisition of Edmundsons Construction Co. have been realised. Group net profit is up from £46,767 to £56,097 after £34,494 tax (*£38,565*). This is in line with the minimum £20,000, before tax, which the new contracting subsidiary was expected to earn in 1960. Dividend is held at 16%.

R. and A. G. Crossland

Dividend exceeds expectations at 30% on capital increased by a one-for-two scrip issue, compared with an equivalent 25% previously. Profit rose from £95,985 to £115,051 before tax of £58,240 (*£47,375*).

Dewhurst and Partner

A one-for-one scrip issue is proposed, but the new shares will not carry a vote. The move will capitalise £360,000 of undistributed profits, which stood at £525,000 last September.

Drayton Regulator

Net profit is a record at £150,392, compared with the previous peak of £145,038 in 1959, and dividend is raised by 2½% to 25%, which is twice covered. Latest result is after £154,693 tax (*£140,163*).

C. A. Parsons

Profits in 1961 should be at a fairly high level, but thereafter lower profits must be expected, the chairman forecasts in his annual report. Dealing with some long-term trends, he says the tendency in heavy industry until recently to increase manufacturing capacity now seems to be matched by reduced profit margins, and while world demand for power has not slackened, much larger sets may mean less work for manufacturers. There is a world-wide excess of manufacturing capacity for turbo-generators and transformers, and Parsons have not in hand a programme which calls for the particularly heavy capital expenditure of recent years. However, in 1960 output from the factory for both turbo-generators and transformers created records and on "much increased" sales the parent company lifted trading profit from £3,189,245 to £4,756,143. The subsidiaries also had a successful year and, though the rise in group net profits from £2,089,614 to £2,519,666 exceeded market expectations, it does not fully reflect the year's gain, because the 1959 tax was £1 million lower than normal.

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1956	4,775,222	2,340,420	45·0	8¼	69/2	41/-
1957	4,585,803	2,093,648	40·2	7½	71/6	43/6
1958	3,902,772	1,886,784	34·2	7½	55/10	43/-
1959	4,478,638	2,089,614	37·6	10	59/6	42/-
1960	6,033,127	2,519,666	48·6	12½	59/6	43/6

Power Securities Corpn.

Ordinary dividend is maintained at 15% and the prefs. again receive a participating 3% making 10% in all, but net profit is back sharply from £626,473 to £374,717 after tax of £335,877 (*£372,995*). Although international contracting is expected to fluctuate, the group's profits have grown steadily in the past few years and the latest setback was something of a shock to the market.

Dividends Declared

Atlas Electric and Gen. Trust. Final is raised to 6% from an equivalent 5½%, making 9% for the year, against 7½% previously.

Contactor Switchgear. Interim 4% *(same).*

Eveready South Africa. Interim is raised to 6% from an equivalent 5.6%.

Holophane. Interim 10% (6%), but increase does not indicate higher total.

Radio Rentals. Interim 3d (*same*).

Worthington-Simpson. Final 15% (previously 12½%) making 25% for the year (*20%*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

5 May—Lancashire C.C. Rewiring of: Hindley Green County Secondary School, Urmston Grammar School and Worsley Walked C.E. School.—See 27 April issue.

6 May—Dunbarton C.C. Provision, erection and wiring of 22 street lighting columns in Vale of Leven/Renton Special District. Applications to County Sanitary Inspector and Lighting Superintendent, N. Macdonald, 124 Bridge St, Alexandria, by above date.

8 May—Lancashire C.C. Re-wiring of: Droylsden Fairfield High School for Girls, Ramsbottom County and County Secondary Schools; Tyldesley Boys' County Secondary School; Whitefield Stand Boys' Secondary School; Atherton St. George's Junior School; Heywood All Souls' School; Middleton Rhodes County School; Barrowford County and County Secondary Schools; Eccles Grammar School. Applications to County Architect, P.O. Box 26, County Hall, Preston, by above date.

8 May—Morecambe and Heysham B.C. Electrical installations for 85 market stalls, Poulton Hall Market.—Advertised 27 April issue.

8 May—Rochester C.C. Electrical installations, 32 houses, Maidstone Rd estate.—See 27 April issue.

9 May—Hebburn U.D.C. (2) Electrical installations in 24 flats and 24 maisonnettes.—See 13 April issue.

9 May—Newcastle C.C. Supply of lamps for year. Central Purchasing Officer, 35 City Rd.

10 May—Bath C.C. Electrical installations, 16 flats and three pairs of houses, Tiverton/Whiteway estate.—See 27 April issue.

10 May—Tycor, Waterford. Electrical installation, comprising h.t. and l.t. switchgear, cables, motive power and lighting for Munster Chipboard Ltd.—See 27 April issue.

11 May—Neston U.D.C. (c) Electrical installation in maisonnettes, Liverpool/Raby Pk Rd estate. Clerk, F. H. D. Hartman, Town Hall, Neston, Wirral.

12 May—Enniskillen R.D.C. Electrical installation in new council offices, etc.—See 27 April issue.

12 May—Rotherham and Mexborough. Applications for inclusion in list for electrical maintenance work to Secretary, Hospital Management Committee, Fern Bank, Doncaster Rd, Rotherham, by above date.

15 May—Argyll C.C. Electrical installation in Dunoon Grammar School, Ardenslate Rd. Apply to County Architect, County Offices, Dunoon, by above date.

15 May—Ayr C.C. Supply: lamps.—See 27 April issue.

15 May—Barr. Electrical installation in new Primary School.—See 27 April issue.

15 May—Burton Latimer U.D.C. 28 Class "A" steel columns with mercury vapour lanterns.—Advertised 20 April issue.

15 May—Keighley B.C. (a) Provision of picture lighting at Cliffe Castle for Libraries, Arts and Museum Committee. Borough Engineer, T. D. Williams, College St. Deposit £1.

15 May—N. Ireland. Electrical installation in Jonesboro' Primary School extensions.—See 27 April issue.

15 May—Rochdale C.B.C. Laying of street lighting cables (fixed-price basis). Borough Surveyor, Town Hall.

15 May—Rowley Regis B.C. 545 Group "B" concrete columns/lamps/equipment.—See 27 April issue.

16 May—Dublin C.C. Supply street lighting equipment: (1) mild steel bands for "Howth" lighting brackets; (2) sheet metal boxes for control gear; (3) sodium lanterns. Engineer and Town Planning Dept, 28/9 Castle St.

16 May—Hebburn U.D.C. (2) Electrical installations in 14 maisonnettes in two four-storey blocks, Central area redevelopment. Applications to Engineer and Surveyor, Argyle St, by above date.

16 May—Maghera. Electrical installation in St. Patrick's new Voluntary Intermediate School.—See 27 April issue.

17 May—Co. Tyrone. Electrical installation in Drumquin new Primary School.—See 27 April issue.

17 May—Manchester C.C. Electrical installation in St. Thomas's C. of E. School, Ardwick. City Architect, P.O. Box 488, Town Hall.

19 May—Basingstoke B.C. Underfloor heating and lighting installation included in contract for two 24 ft by 30 ft timber buildings at municipal caravan site. Borough Surveyor, Municipal Bldgs. Deposit £2 2s.

19 May—Braintree and Bocking U.D.C. Wiring, by contractors on N.I.C.E.I.C roll, in 24 existing houses, Cunnington Rd. Engineer and Surveyor, Town Hall, Braintree. Deposit £1 1s.

19 May—Durham C.C. Supply of lamps for year. Director of Education, G. H. Metcalfe, Shire Hall, Durham.

19 May—Durham C.C. Supply, erection and putting into service of 400 W colour-corrected mercury lighting on 30 ft steel columns at Lanchester Rd Ends roundabout and 200 W linear sodium lighting on 35 ft columns at Pity Me roundabout, comprising 27 units for A1 By-pass scheme. County Surveyor, Aykley Heads, Durham.

19 May—Plymouth C.C. Provision of illuminations scheme.—See 20 April issue.

19 May—Staffordshire C.C. Supply and installation of 12 car radio/telephones. County Medical Officer of Health, County Bldgs, Stafford.

20 May—Reigate B.C. Supply and erection of 19 Group "A" street lighting columns and equipment for road widening scheme. Borough Engineer, Town Hall.—Advertised in this issue.

24 May—Cheltenham B.C. (1) Supply of 64 60 W and 42 45 W sodium lanterns/gear; (2) supply and erection of 106 fluted steel columns/fitting/wiring.—Advertised 27 April issue.

24 May—Fermanagh C.C. Electrical work in Mullagh Primary School extensions and alterations. Details from consulting engineer, J. Ogle, 63 Main St, Bangor, Co. Down. Deposit £3, made payable to County Education Committee.

25 May—Bridport B.C. Supply and erection of 51 Group "B" Stewarts and Lloyds fluted columns/brackets and 125 W mercury vapour lamps at Barrack St and St. Andrews Rd. Borough Engineer, Municipal Offices, South St. Deposit £2 2s.

29 May—Barrow-in-Furness C.B.C. Supply and erection of screening plant, motors and control gear for Sandgate pumping station reconstruction. Borough Engineer and Surveyor, J. N. Flitcroft, Town Hall.

29 May—Manchester C.C. Supply of two main generators 45 kW 220 V d.c. for sludge vessel *Mancunium* conversion. General Manager, Rivers Dept, P.O. Box 488, Town Hall.

29 May—Manchester C.C. Electrical installation in Aged Persons' Home, Felskirk Rd, Wythenshawe. City Architect, P.O. Box 488, Town Hall.

29 May—West Riding C.C. Rewiring and fire alarm installation, by contractors on N.I.C.E.I.C. roll, in Children's Home, Bramham Hse, Bramham. Division Architect, Salisbury Bldgs, Albert St, Harrogate.

30 May—Kirkham U.D.C. Supply, erection and installation of 14 Group "B" concrete columns and 80 W m.v. lighting/gear/wiring, Freckleton Rd.—See 27 April issue.

2 June—E.B. for N. Ireland. Supply and erection of circulating water pipework and valves at Coolkeeragh. Documents to be issued by above date by consulting engineers, Kennedy and Donkin, 64 Royal Exchange, Manchester 2. Deposit £5 5s made payable to E.B. for N. Ireland.

5 June—Aireborough U.D.C. (1) Supply and erection of 59 Class "B" columns/brackets and fitting/wiring of lanterns; (2) supply of mercury vapour lanterns/gear. Engineer and Surveyor, Council Offices, Micklefield Hse, Rawdon, Leeds. Deposit £2 2s.—Advertised in this issue.

6 June—Dartford Tunnel. (4) Electrical distribution, lighting, tunnel services and pumping installations for M. of Transport.—See 27 April issue.

12 June—E.B. for N. Ireland. 25,000 g.p.m. pumps.—See 6 April issue.

19 June—E.B. for N. Ireland. Specification NI 1633. Supply and erection one 4 MVA 11·8/3·5 kV unit transformer for Coolkeeragh.—See 20 April issue.

No date stated—Dunbarton C.C. 25 lighting

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 110 queries answered this week

"Hanau" operating theatre lamps—agents for? T.B.—Sierex Ltd., 241 Tottenham Court Rd, W.1.

Wall fixings in p.v.c.—suppliers of? R.J.—John M. Perkins & Smith Ltd., London Rd Wks, Braunston, Rugby; Expanded Plugs Ltd., 9-10 College Hill, E.C.4.

"Nuflow" electric irons—address for? E.E.—Scottish Precision Engineering Co., 33 Cadogan St, Glasgow C.2.

"Moulinex" coffee grinders—agents for? E.D.—Brattel Electric Co. Ltd., 27 Old Bond St, W.1.

"Osborn" paint scrapers—makers of? S.P.—Osborn Manufacturing Co. Ltd., 5-13 Highgate Sq, Birmingham 12.

"Zenequip" photolight set—suppliers of? E.T.—Neville Brown and Co. Ltd., 77 Newman St, W.1.

Angle-sided ducting system for the protection of temporary floor wiring in factories, etc.—makers of? M.B.—Vulcascot (Great Britain) Ltd., 87-89 Abbey Rd, N.W.8; Channel Conduits Ltd., Station Rd, Winslow, Bletchley, Bucks.

"Releasall" liquid for the loosening of rusted nuts—suppliers of? T.E.—Ferguson and Timpson Ltd., 155 Minories, E.C.3.

Rechargeable torch for medical use—makers of? C.S.—Chilton Electric Products Ltd., Hungerford, Berks.

fittings and equipment for Garelochhead street lighting.—See 20 April issue.

No date stated—Loch Lee Water Board. 1¼ mile relay cables and lighting/power wiring at Loch Lee.—See 20 April issue.

No date stated—N. of Scotland H.E.B. 54 mile 275 kV double-circuit transmission line between Crauchan and Windyhill.—Advertised 13 April issue.

No date stated—Norwich C.C. Street lighting improvement schemes involving eight roads.—Advertised 20 April issue.

No date stated—St. Johnstone Football Club. Erection of floodlighting and covered enclosure—See 20 April issue.

No date stated—Swinton and Pendlebury B.C. Electrical installations in 94 dwellings. —See 27 April issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

8 May—Argentina. Distribution station at Tostado. Direccion Provincial de la Energia, Primera Junta 2558, Santa Fe. B.o.T. (ESB/13981/61).*

12 May—America. Circuit-breakers: one 14·4 kV 2,000 A and one 22 kV 600 A. U.S. Dept. of the Interior, Bonneville Power Admin., 1001 N.E. Lloyd Blvd, Portland, Oregon. B.o.T. (ESB/13942/61).*

15 May—India. Low tension distribution boxes for 25 kVA to 200 kVA. Controller of Stores, Gujarat Electricity Board, Kothi Bldg, Raopura Rd, Baroda. B.o.T. (ESB/13700/61).*

17 May—America. Four 700 h.p. 2·3 kV squirrel cage motor controllers. Army Engineer District, Portland Corps of Engineers, 628 Pittock Block, Portland 5. B.o.T. (ESB/13697/61).*

23 May—Costa Rica. Six 1·5 MVA three-phase, 34·4/13·8 kV transformers. Instituto Corrarricense de Electricidad, San Jose. B.o.T. (ESB/13628/ 61).*

29 May—Egypt. 120 ton of 100 lb/mile and 60 ton of 200 lb/mile h.d. copper wire; 60 ton of 40 lb/mile and 70 lb/mile cadmium copper wire. Stores and Purchases Dept, Telecommunications Organisation, Opera Exchange Bldgs, Cairo. B.o.T. (ESB/13904/61).*

29 May—S. Africa. VHF-FM transmitter system. Chief Engineer, Kariba Hse, 154 Commissioner St, Johannesburg. B.o.T. (ESB/13948/61).*

1 June—New Zealand. 2,330 mile twin-twisted polythene insulated p.v.c. sheathed cable to N.Z. P.O. specification 487; 985 mile flat twin similar cable to specification 486; and 569 mile of flat twin p.v.c. insulated cable to specification 478. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/13968/61).*

5 June—India. Signalling equipment (divided into 15 groups for various tender dates). Director, Railway Stores, Railway Board, Rail Bhavan, Raisina Rd, New Delhi. B.o.T. (ESB/14167/61).*

7 June—Rhodesia and Nyasaland. Transmission equipment (40 items). Town Clerk, P.O. Box 591, Bulawayo. B.o.T. (ESB/13984/61).*

12 June—New Zealand. Capacitors from 0·01 to 100 mfd for use on from 6 V to 400 V d.c. (11 items). Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/13970/61).*

12 June—Trinidad and Tobago. Distribution line saddle taps (three items); compression joints; street lighting connection saddle taps; metering transformers (two items); meters; and turnbuckles. Purchasing Officer, Electricity Commission, G.P.O. Box 121, Port of Spain. B.o.T. (ESB/13653 to 62/61).*

5 July—India. 10,000 ft p.i.l.c.d.s.t.a. cable 0·1 sq in. four-core and 5,000 ft of 0·04 sq in. four-core and 10,000 ft of two-core 0·04 sq in. all for 1·1 kV. Secretary, Stores Purchase Committee, Government of Mysore, Bangalore. B.o.T. (ESB/13693/61).*

TRADE NOTES

Changes of Address. The North Eastern sales offices of Enfield-Standard Power Cables Ltd., Enfield Rolling Mills Ltd. and London Zinc Mills Ltd. have moved to 8 North Terr, Claremont Rd, Newcastle upon Tyne. Telephone: Newcastle 21473.

Arrow Electric Switches Ltd. are now fully established at Brent Rd, Southall, Middx. Telephone: Southall 2442.

Cardiff office. The Capper Pipe Service and Welding Co. Ltd. have opened a new office at Plymouth Bldgs, 3 Westgate St, Cardiff. Telephone: Cardiff 37541.

Expansion. The production area of Rivlin Instruments Ltd. at their factory on the Yorkstown Industrial Estate at Camberley, Surrey, has been trebled in the last extension, now in use. It includes a new method of encapsulation for resistors.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Bury Electrics Ltd., 2 Agur St, Bury, Lancs. Nom. cap.: £1,000. Dirs.: Wm. Newton and Mary Newton.

Coles (Rentals) Ltd., 118 The Broadway, Bexleyheath. Manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £100. Dirs.: Chas. E. Whicker and Roxanna A. Whicker.

County Gates Electrical Co. Ltd., 115 Poole Rd, Westbourne, Bournemouth. To take over the electrical business of E. A. Godin carried on as "Electromix," and the electrical contracting department of Scott and Scott (Bournemouth) Ltd., etc. Nom. cap.: £100. Dirs.: Evan A. Godin and Malcolm A. Godin.

Electricity Supply Nominees Ltd. The income and property of the Company whencesoever derived shall be applied solely towards the promotion of its objects. Dirs.: to be appointed by the Electricity Council. Subs.: Sir Robertson King, Sir Josiah Eccles, Ronald S. Edwards, Cecil T. Melling, R. A. Finn, Arthur M. Scott, W. B. Noddings and R. D. V. Roberts.

Express Electrical Engineers (London) Ltd. To take over the business carried on as "Express Electrical Engineers Co." at 100 Cleveland Gdns, N.W.2, etc. Nom. cap.: £150. Dirs.: not named. Subs.: P. O. Ansell and G. A. Corderoy.

Fermat Ltd., 118 Brighton Rd, Purley, Surrey. Mechanical and electronic engineers, etc. Nom. cap.: £1,000. Dirs.: not named. Subs.: Geoffrey Johnson and Raymond J. D. Reeves.

Dennis Hawkins City Co. Ltd., 30 Clarendon Rd, Harrow, Middx. Dealers in washing machines and all kinds of electrical appliances, etc. Nom. cap.: £100. Dirs.: Howard C. Everett and Harry C. Webb.

Ipsen Industries Ltd., 53 Victoria Rd, Surbiton, Surrey. Manufacturers of and dealers in heat treating furnaces, etc. Nom. cap.: £100. Dirs.: Harold Ipsen, Mrs Lorraine Ipsen, Cornelius Luiten and Thomas Ruffle.

Island Electrical and Marine Services Ltd. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: Fredk. H. G. Williams, 13 Mill Ridge, Edgware, Middx; and Arthur J. White, 14 Carlton Close, Edgware, Middx.

S. J. Jones and Co. (Mech-Elec) Ltd., Midland Wks, Shoreham St, Sheffield. Nom. cap.: £2,000. To carry on business of general, electrical and mechanical engineers, etc. Dirs.: Sydney J. Jones and Graham W. Jones.

Magnafone Recorder Co. Ltd., 3 Baggally St, E.3. Nom. cap.: £500. Dirs.: to be appointed by subs. Subs.: John Lane, Jeffrey Smith and C. W. M. Lane.

Ronal Electric Ltd., 22 Fairview Rd, Lancing. Manufacturers of and dealers in artificial lighting apparatus, etc. Nom. cap.: £200. Dirs.: Ronald R. Woolven and Robert Statham.

Spikins Radio Ltd., 71 Heath Rd, Twickenham. To carry on business of electrical goods manufacturers, etc. Nom. cap.: £3,000. Dirs.: Arthur R. Ogle and Thomas H. Speight.

Frank Taylor (Electrical) Ltd., 41 High St, Tewkesbury. Nom. cap.: £5,000. Dirs.: Francis E. Taylor and Mrs Emily F. Taylor.

Thorpe and Thorpe (Bahrain) Ltd., Barclays Bank Chmbrs, High St, Godalming, Surrey. To carry on business of electrical engineers, etc. Nom. cap.: £100. Dirs.: Michael Campbell Jones and David Campbell Jones.

J. Ward (Electrical) Ltd., William St, Gosforth, Northumberland. To carry on business of electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Joseph E. Ward and Leslie E. Wordsworth.

Weiner Electronic Co. Ltd., 3 Grosvenor Rd, Ilford, Essex. Nom. cap.: £2,000. Dirs.: Cyril Weiner and William F. Brigden.

CONTRACTS PLACED

Cardiff C.C. Electrical installation, Fairwater Grammar School, W. Edwards (Penarth) Ltd., £9,113. Recommended.

C.E.G.B. (Eastern, London and S.E. Region). Contracts placed during March totalling £297,933 include the following: Bengworth Rd, Brixton, 45 MVA 132/33 kV transformer, Brush Elec. Engineering Co.—Medway, 45 MVA 132/33 kV transformer, Brush Elec. Engineering Co.—Hackney-Shoreditch, 66 kV cabling, B.I.C.C.—Hackney-Shoreditch-Mildmay Pk, 66 kV switchgear mod., A.E.I.—Addington, two 66 MVA 132/33 kV transformers, Yorkshire Electric Transformer Co.—Chelsfield, civil works, J. L. Eve Const. Co.—Three Bridges, 33 kV switchgear, A. Reyrolle & Co.—Aylesbury, civil works, W. & C. French Ltd.—Watford, civil works, J. A. Stirling.

Dewsbury B.C. Electrical installations, 82 dwellings, Thornhill Lees scheme, Smith and Wood, £1,901.

Kingston upon Hull C.C. Electrical installation, Central Library extension, F. Abba and Co.

London C.C. Electrical installations in blocks 1-4, Briscoe Bldgs, Lambeth, Electric Contracts (London) Ltd., £3,860 3s 9d; renewal and improvement of installations at Cephas County Primary and Secondary Schools, Alexander Hawkins and Son Ltd., £6,225 2s.; electrical installation renewal and improvement, Rylands County Secondary School for Girls, St. Pancras, Reid and Barrow Ltd., £4,717 6s 11d; water heater installations: 97 dwellings St. Helier estate, £4,036 6s 3d. and 270 dwellings. Watling estate, £16,073 4s, F. J. Baynes and Co. Ltd.

Luton B.C. Electrical installations: 24 houses, Dellcot Close, J. J. Burtenshaw and Ptnrs., £724.

Nottingham T.C. Heating and lighting installations, Wollaton Branch Library, A. Ford Ltd., £2,543. Recommended.

Sutton-in-Ashfield U.D.C. Supply and erection of 33 Group "A" columns and 140 W sodium lighting along Newark Rd, Abacus Municipal Ltd.

Wessex Hospital Board. Electrical work in hospitals: new out-patient and casualty dept., Royal Victoria, Bournemouth, F. H. Wheeler and Co. Ltd., £3,446; "C" block, Moorgreen, Southampton, Groves and Co., £2,364; food lift installation, Keighley Lifts Ltd., £1,621. Recommended.

BUSINESS PROSPECTS

Ayr. House of Fraser Ltd., Buchanan St, Glasgow, C.1, propose £125,000 buildings, Alloway Rd.

Barrhead B.C. Tender: conversion of 60 houses, Barnes St to 30 dwellings, several works contract. Clerk.

Belfast. Liverpool and London and Globe Insurance Co. Ltd., Bow Bells Hse, Bread St, E.C.4, propose five-storey building, Wellington Pl.

Billingham. Shops/warehouse, etc., proposed by C.A.S. (Industrial Developments) Ltd., St. James Hse, Kensington Sq, W.8.

Birmingham. Marsh and Baxter Ltd., Brierly Hill, propose £700,000 developments, Chester Rd. Planned by Crescent Theatre Ltd., The Crescent, £70,000 theatre, Cumberland St.

Blackpool. Corporation recommended to sell 20,000 sq acres, Preston New Rd, to Thomas M. Nutbrown Ltd., Walker St, for industrial development. Magee, Marshall and Co. Ltd., brewers, Bolton, propose shops/hotel/cafés, etc., Promenade and Cocker Sq.

Blandford. War Office propose rebuilding 30th Signals Regt. barracks at cost of £1¼m.

Blyth. E. Alec Coleman Group, Hyde Park Gate, S.W.7, propose converson of Central Cinema to shops.

Boldon. Gordon Durham and Co. Ltd., Moor La, to erect 54 houses, Farm Hill estate.

Bo'ness B.C. Tender: 22 houses, Grahamsdyke Terr, Dean Rd and Bo'mains Rd. Clerk.

Brentford. Factory, Palmerston Rd, W.3, for Invicta Toys Ltd., to be erected by Allnatt (London) Ltd., Park Royal Rd, N.W.10.

Cardiff C.C. Tender: 324 dwellings, Caerau La. City Architect; Sir Percy Thomas and Son, Cathedral Rd, architects for proposed engineering laboratories, Cathays Pk, for University of S. Wales and Monmouthshire. Cost £250,000; proposed health clinic, Albany Rd. City Architect.

Carlisle. Planned: television centre, Durranhill industrial estate, for Border T.V. Ltd., architect: F. T. Wilson and Sons, Barras Bridge, Newcastle. Newcastle Regional Hospital Board, Benfield Rd, propose alteration to provide dermatology unit, Cumberland Infirmary. Board architect.

Cheshire. McAlpine and Son Ltd., Hooton Pk, Wirral, to erect £450,000 offices, Run corn Heath, for I.C.I.

Chester-le-Street. Planned: foundry and electrical equipment workshops for Butsfield Property Co. Ltd., Durham Rd, Birtley.

Christchurch. Earl of Malmesbury proposes hotel/flats/215 bungalows/church, on land St. Catherine's Hill.

Croydon C.B.C. Tender: 28 dwellings, Leighton St area. Engineer.

Darlington. Proposed: psychiatric unit, Darlington Memorial Hospital. Newcastle Regional Hospital Board achitect, Benfield Rd, Newcastle.

Doncaster. Montague Burton Ltd., Hudson Rd, Leeds 9, propose factory extensions, Wheatley Hall Rd.

Dublin C.C. Tender: two five-storey blocks flats, four houses, Rutland Ave area. City Treasurer, Lord Edward St. Tender: factory/offices, Ballyfermot. A. F. Peddy, Upper Pembroke St.

Dungannon U.D.C. Tender: 98 dwellings, Killyman Rd. W. and M. Given, architects, Waterside, Coleraine.

Durham C.C. Proposed: £60,000 mental health centre, Aykley Heads, Durham City. County Architect.

Ealing. Tender: £142,900 out-patients casualty and X-ray depts, for King Edward Memorial Hospital.

Easington. R.D.C. propose 72 houses, King's Rd. Surveyor.

East Lothian C.C. Tender: 45 houses, Cuthill, Prestonpans. County Clerk, County Bldgs, Haddington.

Fareham. Proposed: residential development of 35 acres of land, Peak La, by Bournlands, Bournemouth. Also planned development of 32 acres off Peak La by Brading and Blundell.

Farnham. Church Commissioners, Church Hse, Westminster, S.W.1, propose adaption of Farnham Castle to cost £92,500.

Fife. £234,000 extensions to Madras College, St. Andrews, proposed, also modernisation of King's Rd School, Rosyth, costing £385,900. County Architect, Cupar.

Gateshead. Millerdale Properties Ltd., Dean St, Newcastle, plan development of shopping centre on five acres, High St area. Estimated cost £1m. C.B.C. Tender: nursery school, Bensham Grove. Surveyor.

Glasgow. Scottish Site Improvements Ltd. propose office block, West Regent St area.

Hastings. Planned by A. Class and Son, Gt. Sutton St, E.C.2, 113 dwellings, Sedlescombe Rd North.

Hatfield. E.E.B. propose £90,000 training school, Essendon Pl; Contractors: F. Hitch and Co. Ltd., Church St, Ware.

High Wycombe. Laboratories/offices, Coronation Rd, proposed by Floor Treatments Ltd., Wycombe Hse, Amersham Hill; contractors: Howard Farrow Ltd., Highfield Rd, N.W.11.

Hinckley U.D.C. Proposed: installation of Class "A" mercury lighting, Spa La and sodium lighting, Park Rd area. Surveyor.

Humberstone. Sheffield Regional Hospital Board propose occupational therapy unit, The Towers Hospital.

Leeds. Town Centre Securities Ltd. propose £2 million development, Woodhouse La site.

Leics C.C. propose new infants' school, Beacon Rd, Loughborough. County Architect, Leicester.

Lindsey C.C. £120,485 new secondary school, North Somercoates, proposed. County Architect, Lincoln.

London. Planned: 30-storey hotel, Portman Sq, W. area; Portman Family Settled Estates, Seymore St, W.1. Min. of Works award £92,552 contract for telephone engineering works, Friern Barnet, to Howard Farrow Ltd., Highfield Rd, N.W.11. A.R.I. Aitken, Rowley Green Rd, Arkley, Barnet, architect for Booth and Driver new factory, Whetsone Cl, Friern Barnet, N. Proposed, industrial premises, Railway Rise, East Dulwich; Architects: R. Siefert and Ptnrs., Red Lion Sq, W.C.1. South West Metropolitan Hospital Board, Eastbourne Terrace, W.2, propose £350,000 development, St. John's Hospital, Battersea. Enthoven and Mock, Raymond Bldgs, Gray's Inn, W.C.1, architects for proposed £100,000 improvements to City of London College, Moorgate, E.C.2. P.L.A. plan dock offices, St. Katherine's Dockhouse, East Smithfield; architects: Basil Spence and Ptnrs., Queen Anne St, W.1. Extensions costing £300,000 proposed for A. Barton and Co. store, Wood Green, N.22; architects: Vine and Vine, Station Rd, N.22. Proposed, offices Brixham Hill, S.W.2, cost £100,000; quantity surveyors: Tucker and Huntley, Old Brompton Rd, S.W.7. Scott, Brownrigg and Turner, architects, Parliament St, S.W.1, propose shops/offices/maisonnettes/cinema, Streatham High St. B.T.C., Marylebone Rd, propose reconstruction Streatham Hill station, with shops/offices. H. Neal Ltd., Baker St. W.1, contractors for £400,000 redevelopment on site, Whitcombe St, Paxton St, for Savoy Hotels. Extensions proposed to Clifton Hotel, Welbeck St, W.1, to cost £200,000, Washington Group Hotels (Management) Ltd. Trehearne, Norman, Preston and Ptnrs., Kingsway W.C.2, architects for proposed Strand redevelopment, including rebuilding Adelphi Theatre.

Manchester. Chorlton Warehouses Ltd., Chorlton St, propose 11-storey H.Q. building. Halls of Residence costing £594,521, planned for Royal Technical College, Salford, at Oaklands site.

Middlesbrough C.B.C. Tender: 28 houses, two flats, Easterside. Engineer: Evans, Cartwright and Collatt, Clarendon St, Nottingham, architects for Metropolitan Railways Surplus Lands Co. propose redevelopment, Dundas St area, including shops and seven-storey offices. T.C.: 50 houses, Dunstable Rd, proposed. Engineer.

Newcastle. Vickers Armstrong (Engs.) Ltd., Elswick Wks, propose showrooms/offices, Scotswood Rd, to own plans.

Oldham C.B.C. Tender: 44 dwellings, Littlemoor La. Cameron and Middleton, 21 Mumps, chartered surveyor.

Oxford. Proposed, by Pressed Steel Co., Cowley, five-storey block, apprentices training college and four-storey telephone exchange and office, Eastern By-pass. Planned: nuclear physics and theoretical and teaching physics laboratories, Keble Rd Triangle, for University Chest, Clarendon Bldgs, Broad St. C.C. Tender: primary school, Tower Hill, Witney. Gerald Banks, London Rd, Bicester.

Penicuick B.C. Tender: 49 houses, second stage of Shottstown redevelopment. Morham and Brotchie, Hanover St, Edinburgh.

Peterborough R.D.C. Proposed: 87 dwellings. Hodney Rd, Eye. Cost £164,792. Architect, S. E. Dodson, Priestgate; Planned: private housing estate, Thorpe Lea Rd area, by C. W. Shelton Ltd., bldrs, Stanground. Development of Broadway, Midgate area proposed by Oddenino's Property and Investment Ltd., Berkeley Sq, W.1.

Plymouth C.C. Tender: 90 flats in 16-storey block, Ker St, Devonport. City Architect.

Portsmouth. Planned: new factory, Dundas La, Copnor, for Metal Box Co., Baker St, W.1. New factory, Alveston Rd, Fratton industrial estate, for J. Mckinney and Son Ltd., of that address.

Redcar. T.G. Construction Ltd., Wolverhampton, awarded £949,972 contract for 492 houses and garages, The Lakes site.

Romford. Royal Mutual Insurance Society Ltd., Finsbury Sq, E.C.2, propose factories, New St; contractors: A. E. Fruitnight and Sons Ltd., Bridge Cl.

St. Austell U.D.C. Tender: 22 houses, Tregoney Hill, Mevagissey. Engineer.

St. Neots U.D.C. Proposed: blocks flats/houses, Barford Rd estate. Surveyor.

Scarborough. Proposed: rebuilding food factory, London Inn Yd, Bar St, for W. Greenlay Ltd.; architects: Wilkinson, Smith and Brittlebank, Martins Bank Chmbrs.

Shrewsbury B.C. Tender: seven shops and seven dwellings, Harlescott Grange. Surveyor.

Spennymoor. Holland & Hannen and Cubitts, Team Valley, Gateshead, awarded Durham Coal Board contract for area offices.

Stockton. Hughill Forge and Engineering Co., Church Rd, to erect factory, Portrack Rd, for Reay Brass Foundry Co. Proposed by Newcastle Regional Hospital Board, Benfield Rd, first stage of general hospital, Hardwick; cost £1,200,000.

Thurles U.DC. Tender: 38 houses, Garryvicleheen. Clerk, Thurles, Co. Tipperary.

Tynemouth. D. Brown, Lambton Rd, Jesmond, Newcastle, architect for proposed St. Mary's R.C. Primary School.

Wanstead and Woodford B.C. Tender: 122 dwellings, Eastern Ave. Tooley and Foster, Midland Bank Chmbrs, Buckhurst Hill.

Welwyn. Production bldg proposed by Roche Products, manufacturing chemists, Broadwater Rd.

West Hartlepool. B.C. propose sports stadium, Victoria football ground, including swimming pool.

Woking U.D.C. Tender: 58 dwellings, Maybury estate, 12 old people's flats, Knaphill. Engineer.

York C.C. Tenders: completion of branch library, Fifth Ave; conversion of cloakroom to electronics laboratory and radio-television service room. City Architect.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Capel Electrical and Radio Co. Ltd. General meeting to be held at 124 High St, Dorking, on 25 May, at 3 p.m., for the purpose of having an account of the winding-up laid before members.

George Gill (Washing Machines) Ltd. Mr D. Armitage, Brotherton Chmbrs, Westgate, Leeds 1, appointed liquidator at extraordinary general meeting on 28 March for the purpose of voluntarily winding-up.

Washer Services and Supplies Co. Ltd. Meeting of creditors to be held at H. L. Price and Co., 47 Mosley St, Manchester 2, on 4 May, at 2.30 p.m.

Lee Domestic Appliances Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 8 May.

Philip Greene Ltd. Last day for receiving proofs for intended dividend: 10 May, by liquidator: H. M. Arthur, 6 Cavendish Court, 11-15 Wigmore St, W.1.

Derwent Exports Ltd. Dividend per £: 9¼d, payable at 100 Park St, W.1, on 15 May.

Sigma Electrical Mnfg. Co. Ltd. General meeting to be held at York Hse, 38 Gt. Charles St, Birmingham 3, on 17 May, at 3 p.m., for the purpose of having an account of the winding-up laid before members.

BANKRUPTCY ACTS

Public Examinations

Newcastle upon Tyne. W. D. Mackin, electrical retailer, carrying on business as Tyne View Electrical Sales and Service, at 34 Tyne View, Lemington; and 28 Wansbeck Rd, Gosforth. Public examination: 10.30 a.m., 23 May, at Court Hse, 56 Westgate Rd, Newcastle.

Derby. L. Treadgold, television, radio and electrical retailer, carrying on business at 198 King St, Alfreton. Public examination: 10 a.m. 14 June at Court Hse, 20 St. Peter's Church Yd, Derby.

Southampton. C. Day, electrical dealer, carrying on business as C. Day and Sons of 60 Dean Rd, Bitterne. Public examination: 11 a.m. 21 June at County Court, Castle Sq, Southampton.

Liverpool. C. E. Badger, electrical appliance dealer, carrying on business at 211 Gt. Homer St, Liverpool 5. Public examination: 10.30 a.m., 6 June, at Court Hse, India Bldg, Water St, Liverpool 2.

Chester. K. Jones, electrical and general dealer, carrying on business at 114 Brunswick Rd, Buckley. Public examination: 10.15 a.m., 30 June, at Court Hse, The Castle, Chester.

Intended Dividends

Cardiff. R. J. Bickerstaffe, electrical goods retailer, formerly carrying on business as the R.J.B. Continental Electrical Co. at 24 Ormond Rd, Richmond; 31 Richmond Rd, Kingston upon Thames; and Dumfries Chmbrs, St. Mary St, Cardiff; and as Continental Electric (Cardiff) at 39 Castle Arcade, Cardiff. Last day for receiving proofs for intended dividend: 9 May, by trustee: W. H. Meredith, County Court Bldgs, Westgate St, Cardiff.

Stafford. A. Owen and L. G. A. Shaw, electrical contractors, formerly carrying on business as Owen and Shaw at Corner Shop, Cross Roads, Hixon. Last day for receiving proofs for intended dividend: 5 May, by trustee: W. H. Meredith, 12 Lonsdale St, Stoke-on-Trent.

Dividends

Brighton. A. L. Lankester, building and electrical contractor, carrying on business at 65 St. Thomas's Rd, Worthing. Dividend per £: 2s, payable at Offices of Bradley-Hole, Croydon and Co., 7 Old Steine, Brighton 1, on 4 May.

Bristol. G. S. R. Maggs, formerly carrying on business as G.M.C. Electrical Co. at 3 Regent St, Clifton. Dividend per £: 1 1/16d, payable at Official Receiver's Office, 26 Baldwin St, Bristol 1, on 5 May.

Southampton. C. H. Clegg, radio, television and electrical dealer, formerly carrying on business as Colens and as Colins Electrical Services at 178 Burgess Rd, Southampton; and Bulford Market Sq, Bulford. Dividend per £: 11¼d, payable at Bank Chmbrs, 1 John St, W.C.1, on 31 May.

Appointment of Trustee

Swansea. B. Jones and B. Rocis, electrical retailers, formerly carrying on business as Deal Electrics at 13-14 Pembroke Bldgs, Swansea; and 26 Commercial Rd, Pembroke Dock; and previously at 8 Pembroke Bldgs, Swansea. Mr G. H. Down, 106 Walter Rd, Swansea, appointed trustee as from 17 April.

Release of Trustee

Plymouth. L. W. Brown, radio, television and electrical engineer, carrying on business at 18 Lower Lux St, Liskeard. Trustee: A. D. Gwyther, Royal Bldg, St. Andrew's Cross, Plymouth, released as from 13 April.

Rescinding Order

Croydon. M. H. Gibson, electrical dealer, carrying on business as Housewives Electrical Aids at 17 Vincent Rd, S.E.18. Receiving order dated 13 Feb. rescinded on the grounds that the order ought not to have been made.

MEETINGS TO NOTE

THURSDAY, 4 MAY

A.S.E.E. (Brighton, Hove and District). "Production of a Technical Journal," R. Baldwin (Editor, ELECTRICAL TIMES). New Imperial Hotel, First Ave, Hove. 7.30 p.m.

FRIDAY, 5 MAY

I.E.E. (Medical Electronics Group). Discussion: "Artificial Muscles." Savoy Pl, W.C.2. 6 p.m.

I.E.S. (Edinburgh) Joint meeting with Glasgow and Newcastle Centres at Peebles until 7 May.

A.S.E.E. (Liverpool and District). "Particle Accelerators," B. S. Halliday, Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

A.S.E.E. (Stoke and Crewe). "Plastics in the Electrical Industry," A. J. J. Moulam. Grand Hotel, Hanley. 7.30 p.m.

A.P.I.E. (S. Western). Spring meeting at Queen's Hotel, St. Mary St, Cardiff. 2.30 p.m.

MONDAY, 8 MAY

I.E.E. (Electronics and Communications Sections). "The Corona-Discharge and its Application to Voltage Stabilisation," E. Cohen and R. O. Jenkins: "Impedance Frequency Characteristics of Glow-Discharge Reference Tubes," F. A. Benson and P. M. Chalmers: and "Comparison of Argon, Krypton and Xenon as Admixtures in Neon Glow-Discharge Reference Tubes," F. A. Benson and G. P. Burdett. Savoy Pl, W.C.2. 5.30 p.m.

A.S.E.E. (Aldershot and District). "Stage Lighting," Queen's Hotel, High St. 8 p.m.

TUESDAY, 9 MAY

I.E.E. (N. Western). A.G.M. and "The Protection of High Voltage Systems from Lightning Faults," R. H. Golde. Engineers' Club, Albert Sq, Manchester. 6.15 p.m.

I.E.S. A.G.M and "What is Good Architecture," F. B. Allsopp. Federation of British Industries, Tothill St, S.W.1. 6.15 p.m.

ELECTRICAL DEVELOPMENT ASSOCIATION. A.G.M. and lunch at Savoy Hotel, W.C.2.

A.S.E.E. (East Kent). "Mechanical Refrigeration," W. Boag. Clarendon Hotel, Broadstairs. 8 p.m.

A.S.E.E. (South Wales). Members' Papers Evening, at Park Hotel, Park Pl, Cardiff. 7.30 p.m.

WEDNESDAY, 10 MAY

I.E.E. (Supply Section). "Electricity Supply in India and its Future," M. Datta. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (S.W. Scotland). A.G.M. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

A.S.E.E. (Birmingham). "Inland Waterways," L. Barnard. Birmingham Exchange and Engineering Centre, Stephenson Pl. 7.30 p.m.

A.S.E.E. (Luton). "Electrical Control Gear for Oil-Fired Boilers," J. S. Smith. Luton College of Technology Park Sq. 8.15 p.m.

ROYAL SOCIETY OF ARTS. "The Future Pattern of University Education in the United Kingdom," J. S. Fulton. John Adam St, W.C.2. 6 p.m.

THURSDAY, 11 MAY

SOCIETY OF INSTRUMENT TECHNOLOGY (Control Section). A.G.M. 6.15 p.m.; and "Control Mechanisms in the Human Nervous System," Dr W. Grey Walter. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

I.E.E. (Bristol Graduates and Students). A.G.M. Bristol University. 7 p.m.

A.S.E.E. (Bradford and District). "The Electrical Association for Women." Mrs A. R. Hutchison. The Midland Hotel. 7.30 p.m.

FRIDAY, 12 MAY

I.E.E. (Education Circle). Discussion: "The Place of Transistors in National Certificate Courses." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N. Scotland). A.G.M. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

I.E.S. (Birmingham, Cardiff, Bath and Bristol). Joint summer meeting at Abbey Hotel Malvern, until 14 May.

MONDAY, 15 MAY

I.E.E. (Electronics and Communications Sections). Five Papers on Banana Tube Colour Television System. Savoy Pl, W.C.2. 5.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Manchester). A.G.M. followed by "The Thermocouple," Dr A. W. Foster. Nags Head, Jacksons Row. 6.45 p.m.

INSTITUTE OF FUEL. Summer meeting and conference at Bournemouth until 19 May.

TUESDAY, 16 MAY

I.E.E. (S.E. Scotland). A.G.M. and "Electricity Supply in India and its Future," M. Datta. Carlton Hotel, Edinburgh. 7 p.m.

INSTITUTION OF CIVIL ENGINEERS. "St. Lawrence Power Project—Hydraulic Features," O. Olden. Gt. George St, S.W.1. 5.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Southern Section). A.G.M. and "Electronic Techniques in the Measurement of Acoustic Noise." K. R. McLachlan. Farnborough Technical College. 7 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Brilag. 814,366. Class 9. Safety fuses, etc.

Saphyre. 814,367. Class 9. Distribution boards, safety fuses, etc. Parmiter Hope and Sugden Ltd., Fluvent Electrical Wks, Newton Ave, Longsight, Manchester 12.

Camlecon. 809,931. Class 9. Devices for making electrical connections. Belling and Lee Ltd., Gt. Cambridge Rd, Enfield.

Derion. 816,425. Class 11. Centrifugally operated installations for the recovery of industrial dusts. Derion Ltd., 71 The Crescent, Henleaze, Bristol.

Doulton Multicone. 809,204. Class 17. Porcelain h.t. insulators. Doulton and Co. Ltd., Albert Embankment, S.E.1.

Fonadek DG4. 810,875. Class 9. Dictating machines, etc. Fonadek (Branson) Ltd., Knightsdowne Hse, Vivian Rd, Harbourne, Birmingham 17.

Herald. 812,437. Class 7. Washing machines. Goblin (B.V.C.) Ltd., Goblin Wks, Ermyn Way, Leatherhead.

Robotron. 812,050. Class 9. Timing control apparatus for welding machines. Robotron Corpn., 21300 West Eight Mile Rd, Detroit 19, U.S.A.

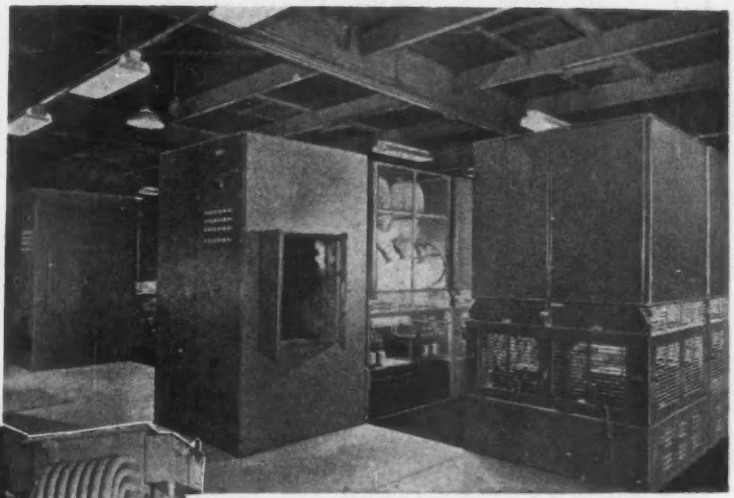
Sheerline B811,933 and **Tablevac** 816,233. Class 9. Vacuum cleaners, etc. Bylock Electric Ltd., 109 South St, Enfield, Middx.

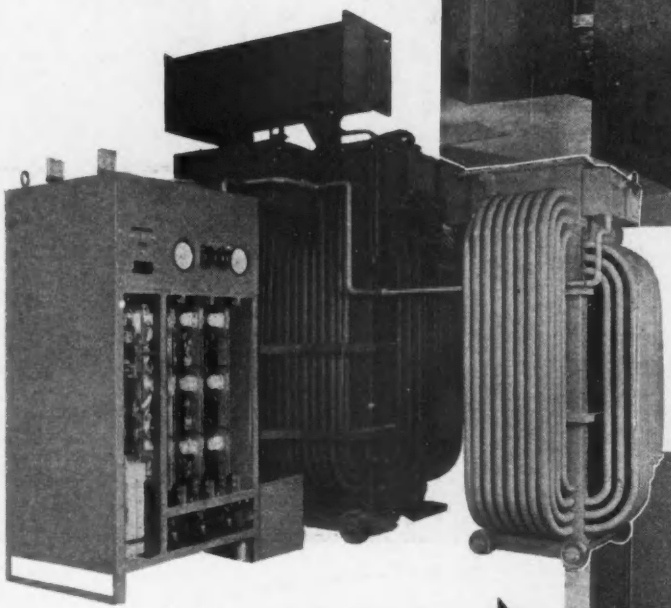
Stearns Magnetic in design. 803,808. Class 7. Magnetic separators, etc. 803,809. Class 9. Magnets, etc. Indiana General Corpn., 405 Elm St, Valparaiso, Indiana, U.S.A.

—RECTIFICATION—

MERCURY ARC

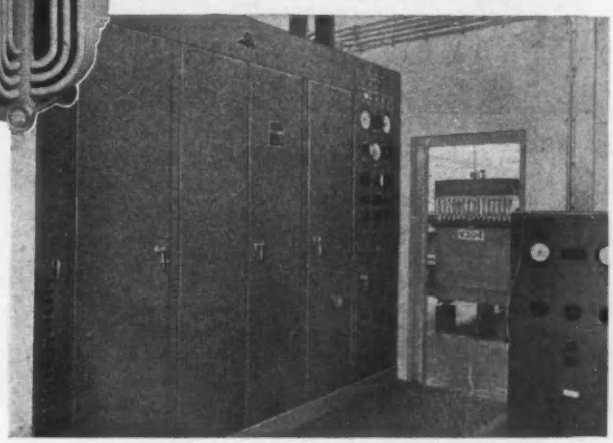
A Mercury Arc Rectifier installation at the works of Western Chemicals Ltd., Alberta, providing an output of 12,000 amps at 510 volts D.C. for electro-chemical duty.





SILICON

A 750 kW 3,000 amp forced air-cooled Silicon rectifier for electrolytic duty in Persia. A voltage regulator is included for voltage variation over the range 180/250 volts D.C.



GERMANIUM

A 6,000 amp water-cooled Germanium rectifier providing a continuous output at 100 volts D.C. for an electrochemical process at the Luton Works of Laporte Industries Ltd.

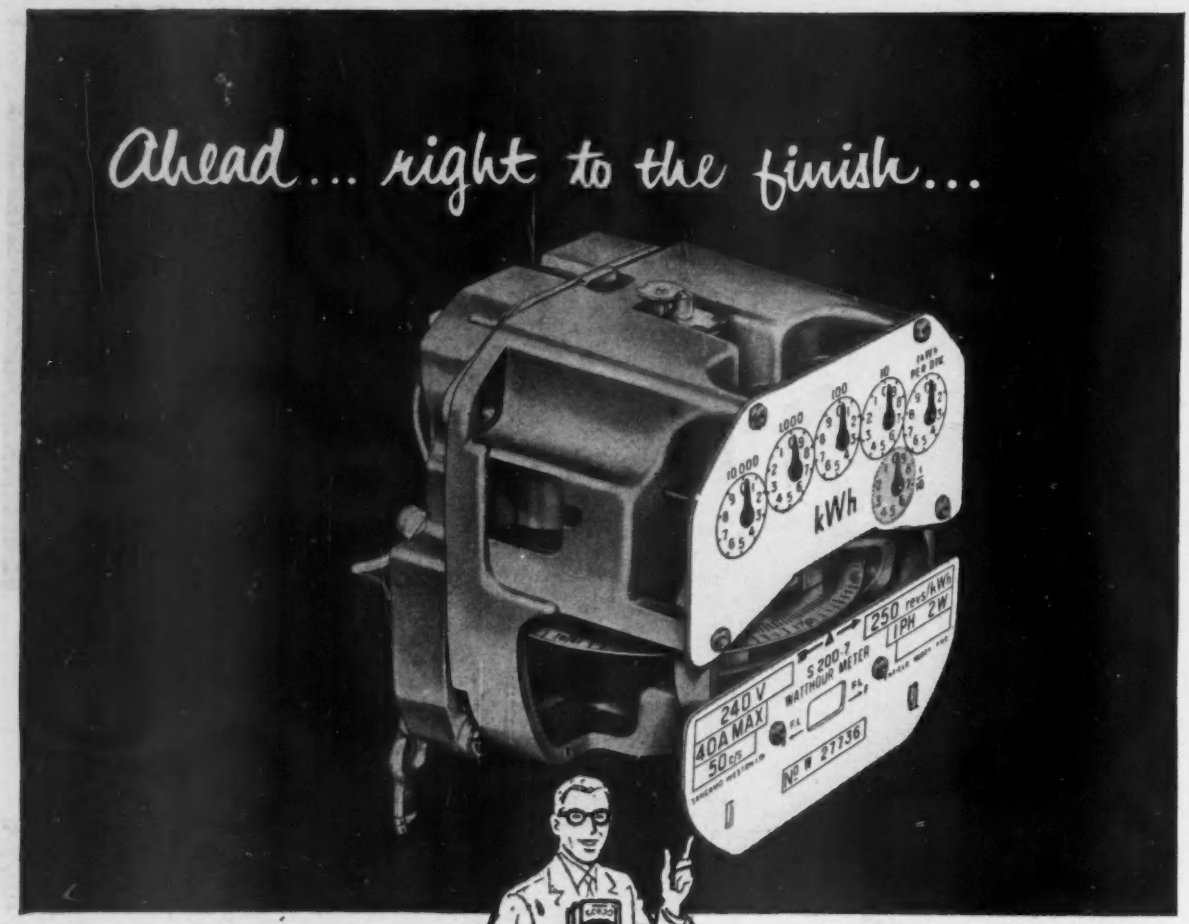
— MERCURY ARC OR SEMI-CONDUCTOR —

HEWITTIC RECTIFIERS

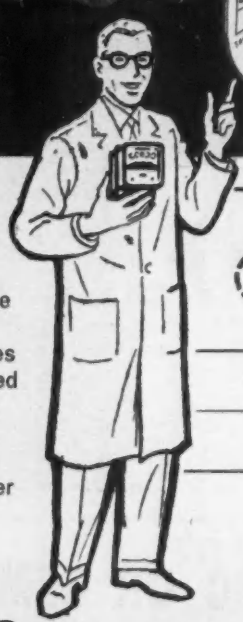
HACKBRIDGE & HEWITTIC ELECTRIC Co. Ltd.
HERSHAM · WALTON-ON-THAMES · SURREY
Telephone: Walton-on-Thames 28833 (8 lines)
Telegrams & Cables: Electric Walton-on-Thames

H

Ahead... right to the finish...



The external finish of the Sangamo Model S200 Meter is taken care of by Bakelite mouldings—proved by more than 25 years of complete satisfaction. The internal finishes reflect the tremendous care in the choice of materials and finishes which has made the S200 the most advanced Watthour Meter of the day. Quantity production in the world's most modern meter factory leads in turn to production economies which are passed on to the user in the form of finer materials, finer specification . . . in short, a better meter for the money.



"SUPERB FINISH IN EVERY ASPECT..."

BASE AND COVER ROBUST BAKELITE MOULDINGS OF MODERN DESIGN

ANTI-CORROSION FINISHES USED THROUGHOUT

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MODEL S200-7 SINGLE PHASE WATTHOUR METER

SANGAMO WESTON

Years ahead of its time!

SANGAMO WESTON LTD · ENFIELD · MIDDX · ENGLAND · Tel: Enfield 3434 (6 lines) & 1242 (6 lines) Grams: Sanwest, Enfield
SW/76

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

AIREBOROUGH URBAN DISTRICT COUNCIL
Installation of Class "B" Street Lighting

TENDERS are invited for the supply and installation of Class "B" Mercury Vapour Street Lighting in various streets within the Urban District. Approximate number of points, 59.

Separate tenders are invited as follows:
(1) Supply and erection of columns and brackets and fitting and wiring of lanterns to columns, etc.
(2) Supply of lanterns and all auxiliary gear.

A firm may tender for both, but the Council reserve the right to accept separate tenders from different firms.

Copies of the site plans, instructions to persons tendering, Specifications, Bills of Quantities, Forms of Tender and Schedule of Rates and Prices may be obtained from, and General Conditions of Contract seen at, the office of the Engineer and Surveyor to the Council at the address below, on payment of a deposit of £2 2s, which will be returned on receipt of a bona tide tender or the return of the documents.

Tenders, enclosed in a plain sealed envelope, endorsed "Tender for Street Lighting" must be delivered to the undersigned not later than mid-day on Monday, 5 June, 1961.

The Council does not bind itself to accept the lowest or any tender, and the acceptance of a tender or tenders will be subject to the obtaining by the Council of any requisite consents.

RALPH H. HULME,
Clerk of the Council.

Council Offices,
Micklefield Hse,
Rawdon,
Leeds.
24 April, 1961. (A 492)

BOROUGH OF REIGATE

TENDERS are invited for the supply and erection of 19 Group "A" Steel Lighting Columns and Ancillary Equipment in conjunction with a road widening scheme.

Apply Borough Surveyor for Contract Documents, plan inspection, etc.,

Sealed Tenders in envelopes provided to the undersigned by Saturday, 20 May, 1961.

The Council does not bind itself to accept the lowest or any tender.

HEBER DAVIES,
Town Clerk.

Town Hall,
Reigate. (A 517)

APPOINTMENTS VACANT

MINISTRY OF POWER
H.M. ELECTRICAL INSPECTOR OF MINES AND QUARRIES

PENSIONABLE post for man at least 27 on 1.3.61 who has degree or Dip. Tech. in Electrical Engineering, or has passed examinations qualifying him for graduate membership of I.E.E. Practical training in electrical engineering, and at least two years' recent practical experience in use of electricity in mining essential. National salary scale: £2,280/£2,650. Starting salary may be above minimum. Promotion prospects. Write Civil Service Commission, 17 North Audley St, London W.1, for application form, quoting S5297/61. Closing date: 30 May, 1961. (A 521)

SOUTH WESTERN ELECTRICITY BOARD
FOURTH ASSISTANT ENGINEER
(DRAWING OFFICE)
CHIEF ENGINEER'S DEPARTMENT
HEAD OFFICE, BRISTOL

SALARY according to Class AX, Grade 10, Salary Scale 8, £935/£1,165 per annum of Schedule B of the N.J.B. Agreement.

The duties of the successful candidate will include the design and preparation of drawings, estimates and material schedules in connection with 33 kV outdoor switching stations; also the preparation of load flow, protection and system diagrams and engineering reports.

Qualifications leading up to the Higher National Certificate in Electrical Engineering are desirable and some knowledge of reinforced concrete would be an advantage.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the Establishments Officer, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for receipt of completed applications is 20 May, 1961.

THIRD ASSISTANT ENGINEER
CENTRAL CONSTRUCTION DEPARTMENT
TAUNTON

Salary according to Class AX, Grade 8, Salary Scale 10, £1,105/£1,325 per annum of Schedule B of the N.J.B. Agreement.

Candidates should have good organising ability and should be experienced in detailed planning, estimating, preparation of job and materials schedules, survey and supervision of construction of all classes of overhead lines, substations and underground mains up to and including 33 kV.

Possession of the Higher National Certificate in Electrical Engineering or equivalent qualification is desirable, and the ability to drive a car will be an advantage.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the Establishments Officer, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for receipt of completed applications is 20 May, 1961. (A 529)

THE NORTH WESTERN ELECTRICITY BOARD
SECOND ASSISTANT ENGINEER
SUB-AREA COMMERCIAL DEPARTMENT
PRESTON

THE person appointed will be required to exercise general supervision over the installation Contracting Sections in the Sub-Area and to assist in industrial and commercial load development. Experience in design and the preparation of specifications and plans for all classes of electrical installations and the supervision of staff and manual workers is essential.

Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary Scale: £1,440/£1,610 p.a. Grade L.7. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, and returned to him by 15 May, 1961. (A 515)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area
ROTHERHAM AND MEXBOROUGH DISTRICT
ASSISTANT INSTALLATION ENGINEER

APPLICANTS should have served an apprenticeship and been technically trained in Electrical Contracting work. Experience in varied classes of electrical contracting work, including tendering, preparation of specifications and supervision of a large manual staff will be an advantage.

Salary: N.J.B. Class K, Grade 10, (Scale 9), £1,115/£1,245 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 3 (Sheffield) Sub-Area, Commercial St, Sheffield 1, not later than 19 May, 1961.

No. 7 (Grimsby) Sub-Area
GRIMSBY DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound training and extensive experience in the design, construction, operation and maintenance of h.v. and l.v. underground and overhead distribution systems, substation plant and ancillary equipment in both urban and rural areas.

Salary: N.J.B. Class H, Grade 7 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 7 (Grimsby) Sub-Area, Moss Rd, Grimsby, not later than 19 May, 1961.

No. 4 (Leeds) Sub-Area
WETHERBY DISTRICT
DEMONSTRATOR (FEMALE)

Applicants, who should be suitably trained, will be required to work in the Wetherby District. They should be conversant with all types of domestic apparatus and be capable of demonstrating and selling electrical equipment and giving advice on its use.

Salary: N.J.C. Grade 1, £600 x £25—£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 4 (Leeds) Sub Area, Bramhope, nr. Leeds, not later than 19 May, 1961. (A 526)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified engineers for the following appointments which are subject to the conditions of the National Joint Board.

Tees Sub-Area
SECOND ASSISTANT DISTRICT ENGINEER
BISHOP AUCKLAND DISTRICT

Applicants should have experience in the design, construction, operation and maintenance of h.v. and l.v., overhead and underground distribution systems in urban and rural areas, substation plant and ancillary equipment.

Salary: Schedule A, Class F, Grade 7, £1,040/£1,165 per annum.

TWO THIRD ASSISTANT DISTRICT ENGINEERS
HARTLEPOOL DISTRICT

Applicants should have experience in the construction, operation and maintenance of e.h.v. and m.v., overhead and underground distribution systems in a mixed urban and rural district.

Salary: Schedule A, Class F, Grade 9, £890/£1,015 per annum.

Applications in writing, stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (A 524)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

REPUBLIC OF THE SUDAN

APPLICATIONS are invited to fill the post of

ASSISTANT CHIEF ENGINEER (DISTRIBUTION)

for Electricity Department of the Central Electricity and Water Administration in the Sudan. Applicants should hold a University Degree in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers. They should have had at least ten years' experience in a supply undertaking and have wide knowledge of modern distribution and transmission practice.

The work covers problems associated with planning, operation, maintenance, the preparation of specifications and estimates, correspondence with consultants and manufacturers and the training of Sudanese engineers in this work.

Salary offered is up to £S.2,500 per annum depending on age and experience. In addition, a cost of living allowance of £S.187 per annum is at present paid. A contract of from three to five years (including 12 months on probation) is envisaged and a bonus of 10% of the basic salary earned during the contract is payable on completion. An outfit allowance of £S.50 is paid on first appointment. There is no income tax in the Sudan at present. (£S.1=£1 0s 6d.)

Hard furnished accommodation is provided at a rent not exceeding 7½% of the basic salary. Free medical treatment is provided for official and his family.

Home leave is granted at the rate of 82 days per annum and during a five-year contract a total of 410 days' leave is earned. The first leave is granted after 18 months' service in the Sudan and amounts to 110 days. In each subsequent 12 months, 82 days leave are granted and the remaining balance is taken to expire on completion of contract. Free air passages for official and his family are provided.

Application should be made, in the first instance, stating age, qualifications and experience and submitting copies of recent testimonials, to the Appointments Section, Sudan Embassy, 3 Cleveland Row, St. James's, London S.W.1.

Closing date: 20 May, 1961. (A 504)

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

Expansion of Building Programme

ELECTRICAL DRAUGHTSMEN

APPLICATIONS are invited for posts on the staff of the Engineer to the Board, from those who are interested in designing engineering services for new hospitals, extensions, etc.

Those appointed will work in teams under the general control of an experienced professional engineer, and will normally be engaged on the preparation of tender drawings and specifications.

Applicants for the posts of Draughtsmen Grade I and Grade II should preferably have the Higher National Certificate in Electrical Engineering, or an equivalent qualification. However, applications will be considered for these posts from those who have the necessary experience without having passed these examinations.

Applications for Draughtsmen Grade III will be considered from those who have had three years' practical and theoretical training and who are desirous of entering the field of design as distinct from installation on site work.

Salary Scales: Draughtsmen, Grade I, £1,080/£1,300: Grade II, £910/£1,060; Grade III, £560/£890.

The starting salary will be at the minimum, except in Grade III where the minimum can be exceeded for age and experience.

Applications stating age, qualifications, experience, present appointment and salary, together with the names and addresses of two referees, should be sent to the undersigned at 40 Eastbourne Terr, London W.2, by not later than 15 May.

E. G. BRAITHWAITE,
Secretary.
(A 506)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

VACANCIES—AREA ENGINEER

THE Trinidad and Tobago Electricity Commission has vacancies for two Area Engineers.

Candidates must hold a Higher National Certificate in Electrical Engineering or be Graduate Members of the Institution of Electrical Engineers and must have had experience in the construction, operation and maintenance of Distribution and Transmission systems up to 132 kV.

The annual salary for the first post is £1,662 10s rising to £1,775 and the second post £1,812 10s to £1,937 10s. A car allowance for necessary mileage is also paid and an interest-free loan is available for the purchase of a car. A house furnished with heavy furniture will be provided at a rental of £10 8s 4d per month plus a small extra charge for heavy furniture.

An outfit allowance of £60 is paid on arrival in Trinidad. First class passages to Trinidad will be provided for the successful applicant, his wife and children up to a maximum cost of four adult passages. First class leave passages to the United Kingdom will be provided every three years There is a superannuation scheme similar to the C.E.G.B. and Area Board's Scheme.

Information on Trinidad can be obtained from the West India Committee, 40 Norfolk St, London W.C.2.

Applications giving full details of qualifications, age, experience, etc., together with two recent testimonials should be sent by Air Mail to reach the General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port of Spain, Trinidad, W.I., by 7 June, 1961. (A 516)

CALDERSTONES HOSPITAL MANAGEMENT COMMITTEE

ENGINE DRIVER/SWITCHBOARD ATTENDANT

FOR hospital power house. Rotating shift duties in connection with hospital electricity, steam and hot water services. House available for rent or full board and residence for single man. £10 1s 8d per week of 42 hours, plus 4½d per hour for rotating shift duties. National Health Service conditions and superannuation schemee. Applications giving details of training and experience to the Group Secretary, Calderstones Hospital, Whalley, nr. Blackburn. (A 494)

THE UNITED LIVERPOOL HOSPITALS AND THE SOUTH LIVERPOOL HOSPITAL MANAGEMENT COMMITTEE

APPLICATIONS are invited for appointment to a new post of

ELECTRONICS TECHNICIAN

The work will be associated primarily with the heart departments of the Royal Liverpool Children's Hospital and the Sefton General Hospital.

The duties will include diagnosis of faults, repair, maintenance and calibration of all types of medical/electronic equipment, electrical and general instruments, controllers and recorders: and also the design and construction of components and the modification of machinery and equipment to meet special medical needs. There is scope for the exercise of initiative in a new field of hospital activity and opportunity for innovation and research in collaboration with the medical and technical staffs in the heart departments.

Applicants must possess the Higher National Certificate in Electrical Engineering (with Electronics) and have some relevant practical experience or hold a degree in electrical engineering or be a Corporate Members of the Institution of Electrical Engineers.

The salary scale is £800 x £30(5)—£950 a year. The post is superannuable. Whitley Council Terms and Conditions of Service apply.

Apply stating age, qualifications and experience and giving the names of three persons to whom reference may be made to the Secretary, 80 Rodney St, Liverpool 1, by 29 May, 1961. (A 518)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEERS

APPLICATIONS are invited for the under-mentioned positions in the Board's North Eastern District at Electric Hse, Church Hill, E.17.

ASSISTANT DISTRIBUTION ENGINEER
Grade 9, £1,015/£1,140 p.a. incl.
(Ref.: PER/V/3234/T.)

ASSISTANT DISTRIBUTION ENGINEER
Grade 11, £875/£990 p.a. incl.
(Ref.: PER/V/3235/T.)

The posts are graded under Schedule A of the National Joint Board Agreement as Class G.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

Applications stating age, qualifications, experience and appropriate reference number, should be sent to the Manager at the above address, within 14 days of the publication date of this notice. (A 493)

AIR MINISTRY

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

FOR design construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports.

SALARY according to age, quals. and exp. from £936 (at 25) to £1,430 max., with increase for London and slight decrease in country districts. In addition salary is increased by £75 p.a. (within the maximum of scale) after two years' approved service, subject to being corporate members of Institution of Mechanical or Electrical Engineers. Appointments long term with good prospects of pension and advancement to numerous posts in higher grades, viz.:

Mechanical and Electrical Engineers: £1,456/£1,950, 125 posts;

Senior Mechanical and Electrical Engineers: £2,080/£2,392, 34 posts;

Superintending and above Mechanical and Electrical Engineers: £2,650 upwards, nine posts.

Vacancies occurring in higher grades are filled by promotion of existing staff.

Good opportunities for acquiring exp. overseas where special allowances ranging at present up to £1,800 p.a., according to location and marital status, are payable in addition to higher salary. Five-day week with four weeks' two days' paid leave p.a. initially.

QUALS.: (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship; or (b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship; or (c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering exp. with at least three years' apprenticeship. In addition, all candidates should have been employed for min. of two years with well-established engineering concern and gained wide exp. in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages 25 and 35. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D 128/1A. Selection will be by interview in London and certain expenses will be reimbursed. (A 205)

LONDON ELECTRICITY BOARD

DISTRICT MANAGER

APPLICATIONS are invited from suitably qualified persons for the appointment of District Manager, Western District.

The salary will be in accordance with Class D, Grade 7 of the National Joint Managerial and Higher Executive Grades Agreement (£2,875/£3,100 per annum, including London Allowance).

Applications stating age, qualifications, experience, present position and salary should reach the Secretary of the Board, at 46 New Broad St, E.C.2, by 15 May, 1961. PER/V/3268/T. (A 512)

REPUBLIC OF THE SUDAN

APPLICATIONS are invited to fill the post of

ELECTRICAL INSTALLATION ENGINEER

in the Central Electricity and Water Administration in the Sudan. Applicants should be suitably qualified engineers with at least ten years' experience in all aspects of electrical installation work, a keen commercial sense, ability to prepare estimates and carry out the department's correspondence. The official will be required to assist in the training of Sudanese Engineers.

Salary offered is up to £S.1,920 per annum, depending on experience and age. In addition, a cost of living allowance of £S.187 is at present paid. A contract of from three to five years (including 12 months on probation) is envisaged and a bonus of 10% of the basic salary earned during the contract is payable on completion. An outfit allowance of £S.50 is paid on first appointment. There is no income tax payable in the Sudan at present. (£S.1 = £1 0s 6d.)

Hard furnished accommodation is provided at a rent not exceeding 7½% of the basic salary. Free medical treatment is provided for official and his family.

Home leave is granted at the rate of 82 days per annum and during a five-year contract a total of 410 days' leave is earned. The first leave is granted after 18 months' service in the Sudan and amounts to 110 days. In each subsequent 12 months, 82 days' leave are granted and the remaining balance is taken to expire on completion of contract. Free air passages for official and his family are provided.

Application should be made, in the first instance, stating age, qualifications and experience and submitting copies of recent testimonials, to the Appointments Section, Sudan Embassy, 3 Cleveland Row, St. James's, London S.W.1.

Closing date: 20 May, 1961. (A 503)

NORTH OF SCOTLAND HYDRO ELECTRIC BOARD

North Caledonia Area

SENIOR ASSISTANT ENGINEER
(CONSTRUCTION)

APPLICATIONS are invited for the above superannuated post at Elgin, Morayshire, which is situated four miles from the coast and enjoys a pleasant mild climate.

The successful candidate will be responsible to the Area Engineer for construction of 33 kV and lower voltage substation overhead lines and cable networks by direct and contract labour. Some experience of 132 kV line construction would be an advantage. Qualifications preferably graduate or equivalent.

Salary and conditions in accordance with the N.J.B. Schedule, Class H, Grade 4, £1,440/£1,610 per annum.

Application form obtainable from the Area Manager, West Villa, South St, Elgin, should be returned by 22 May, 1961, quoting Vacancy No. 61/8. (A 540)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Area Headquarters

SENIOR ASSISTANT ENGINEER
(COMMERCIAL)
SALES DEVELOPMENT
POLICY AND PLANNING
CHIEF COMMERCIAL OFFICER'S
DEPARTMENT
95/61.R.

The successful candidate will be required to:

(a) assist in the development of commercial policy by investigating specific projects and making recommendations designed to improve the Board's commercial activities;

(b) prepare periodic progress reports; and

continued in next column

continued from previous column

(c) assist in drafting commercial information for dissemination throughout the Area.

Applicants should have had a sound technical training and preference will be given to those with administrative ability, technical qualifications and wide experience in the vigorous sales of appliances and fittings and the successful operation of comprehensive electrical installation contracting and maintenance department.

This is an interesting appointment which offers the successful applicant a good opportunity to gain wider experience to fit himself for further promotion.

Salary: N.J.B. Grade 2, Class BX, Schedule B:

From 1.7.60 to 30.6.61 £1,695/£2,085.
„ 1.7.61 to 30.6.62 £1,750/£2,085.

Apply by letter to the Chief Commercial Officer, Eastern Electricity Board, P.O. Box No. 40, Wherstead, Ipswich, Suffolk, by 19 May, 1961.

Chilterns Sub-Area

LUTON DISTRICT
FOURTH ASSISTANT ENGINEER
103/61.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary: N.J.B. Class J, Grade 11 (£965/£1,090).

ASSISTANT ENGINEER (COMMERCIAL)
102/61.R.

Candidates should have had experience in advising industrial and commercial consumers on utilisation and negotiating with these consumers on tariff matters. A knowledge of thermal storage heating would be an advantage.

A Higher National Certificate or similar qualification in Electrical Engineering is desirable.

Salary: N.J.B. Class J, Grade 8 (£1,190/£1,325).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487 Dunstable Road, Luton, Beds, by 19th May, 1961.

Essex Sub-Area

SOUTH WEST ESSEX DISTRICT
FOURTH ASSISTANT ENGINEER
100/61.N.

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems including substations.

Salary: N.J.B. Class K, Grade 11 (£1,040/£1,165) plus London Allowance.

Apply by letter to W. T. Langfield, A.M.C.T., A.M.I.E.E., A.I.MECH.E., Manager, South West Essex District, Eastern Electricity Board, Ashton Rd, Harold Hill, Romford, Essex, by 19th May, 1961.

Fens Sub-Area

THIRD ASSISTANT ENGINEER
(CONSTRUCTION)
96/61.N.

This appointment is based at the Construction Unit, St. Neots. A sound technical training to Grad.I.E.E. standard is desirable, together with some experience of construction work in a predominantly rural area.

The work involves the supervision of the construction of 33 kV, 11 kV and L.V. overhead lines and associated equipment. The position offers an excellent opportunity for obtaining experience in other aspects of construction work in a sub-area where construction is centralised.

Salary: N.J.B. Class K, Grade 11, £1,040/£1,165.

Apply by letter to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 19th May, 1961.

continued in next column

continued from previous column

Sub-Area Headquarters

THIRD ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)
97/61.N.

A sound technical training in distribution with qualifications of Grad.I.E.E. standard is desirable, together with some experience in system planning.

The work involves the planning of 11 kV and L.V. extensions in rural and urban areas and opportunities exist for obtaining experience in 33 kV system planning, as well as the whole range of planning work in the sub-area.

Salary: N.J.B. Class K, Grade 10 (£1,115/£1,245).

Apply by letter to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 19 May, 1961.

Northmet Sub-Area

SECOND ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
SUB-AREA ENGINEER'S DEPARTMENT
(Ref. 1063) 104/61.R.

Candidates should have had wide experience in the operation and maintenance of large cable and overhead line networks. They should have administrative ability, as well as the technical knowledge required to cover all aspects of the work including the operational problems of large interconnected networks up to and including 33 kV, the planning and control of all maintenance work, and the commissioning and maintenance of protective gear and supervisory equipment.

Candidates should be Corporate Members of the Institution of Electrical Engineers, or possess equivalent qualifications.

Salary: N.J.B. Class N, Grade 6 (£1,795/£1,950) plus London Allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Cannon Hill, Southgate, London, N.14, by 15 May, 1961.

THIRD ASSISTANT ENGINEER
DEVELOPMENT SECTION
SUB-AREA ENGINEER'S DEPARTMENT
(Ref. 1061) 98/61.N.

Candidates should possess an engineering degree or the Higher National Certificate in Electrical Engineering and should have had experience in the planning and construction of large urban and rural distribution systems at voltages up to 33 kV, including substation design and layout. Experience in load forecasting will be an advantage.

Salary: N.J.B. Class N, Grade 10 (£1,350/£1,500) plus London Allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London, N.14, by 15 May, 1961.

GENERAL ASSISTANT ENGINEER
(SENIOR DRAUGHTSMAN)
SUBSTATION DRAWING OFFICE
SUB-AREA ENGINEER'S DEPARTMENT
(Ref. 1058) 101/61.N.

Candidates should have had a good technical training and experience in the design and layout of switchgear, transformers and associated equipment for indoor and outdoor substations and be capable of supervising staff.

Salary: N.J.B. Class N, Grade 15 (£965/£1,090) plus London Allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 15 May, 1961.

WEMBLEY DISTRICT
FOURTH ASSISTANT ENGINEER
(Ref. 1060) 99/61.N.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class J, Grade 11 (£965/£1,090) plus London Allowance.

Apply by letter to F. H. Long, M.I.E.E., M.AMER.I.E.E., Manager, Eastern Electricity Board, Kingsbury Rd, Kingsbury, N.W.9, by 15 May, 1961. (A 533)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

ELECTRICAL ENGINEER'S DEPARTMENT
NORTHFLEET DISTRICT
Vacancy No. 82A/61.
THIRD ASSISTANT ENGINEER

REQUIRED to be responsible for records, allocation of transport, operation of a Job Card System and detailed planning of stores and material to facilitate the work of Construction, Operation and Maintenance of overhead lines and substations operating at 132 kV and 275 kV within the Northfleet District. Possession of H.N.C. (Electrical or Mechanical) or equivalent qualification and previous experience of work on the transmission system are desirable.

Salary within N.J.B. Class AX, Grade 8, £1,155/£1,375 p.a., including London Allowance.

Applications giving age, details of qualifications, experience, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 17 May.

(A 520)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

GENERAL ASSISTANT ENGINEER
(DRAWING OFFICE)
MECHANICAL

APPLICATIONS are invited for appointment as General Assistant Engineer (Drawing Office) (Mechanical), in the Midlands Project Group's Drawing Office, at Bournville, Birmingham.

Candidates should possess a sound practical and technical training and should preferably be fully qualified. The salary will be within the range £650/£1,090 per annum, in accordance with the National Joint Board Agreement.

Applications should be made on standard form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 22 May, 1961.

Envelopes should be marked "Confidential" quoting Staff Vacancy No. MPG.30/61.

(A 514)

ELECTRICAL TRANSMISSION ENGINEERS-DESIGNERS-SURVEYORS

Electrical, Mechanical, Civil Engineers experienced in overhead transmission lines, steel towers and wood poles; also Engineers experienced underground cable contracts; Designers, Surveyors, Profilers, Draughtsmen — vacancies for all grades. Required for Head Office and Site Work by large Scottish organisation of Contractors for work in all areas of the United Kingdom.

This is an opportunity to join an expanding and progressive Company with diverse activities in the electrical installation contracting field. Good prospects and superannuation.

Write giving full particulars of experience and qualifications, age, married or single, starting salary required. Give permanent address. Applications treated strictly confidential. To Box No. 8283, Electrical Times.

(A 508)

SOUTH OF SCOTLAND ELECTRICITY BOARD

GLASGOW AREA

Applications are invited from suitably qualified Engineers for the following superannuable appointments:

(1) SENIOR ASSISTANT ENGINEER (Meter, Test and Protection)
REF. No. GE/27/61.

Candidates should be Corporate Members of the Institution of Electrical Engineers and have experience in the control of a large staff and a sound knowledge of the Electricity Supply Acts so far as they affect metering. The successful candidate will be responsible for the commissioning of substation protective equipment, E.H.V. fault location, transformer testing, protection, communications (P.A.X. and V.H.F.), metering, meter re-certification programme, including *in situ* certification of E.H.V. metering, and battery installation and maintenance.

Complex metering problems exist within the Area which require a sound technical knowledge of metering techniques. A knowledge of supervisory equipment and electronic summation equipment would be an advantage.

Salary: £1,920/£2,085 per annum in accordance with Class L, Grade 3 (Scale 17), of the N.J.B. Salary Scale.

(2) SENIOR ASSISTANT ENGINEER (Construction)
REF. No. GE/28/61.

Candidates should be Corporate Members of the Institution of Electrical Engineers and have experience in the control of a large construction team comprising building trade operatives, mechanical and electrical fitters, jointers and cable layers. The successful candidate will be responsible for the erection and commissioning of large 33 kV primary and 6·6 kV secondary substations, conversion of existing primary substations from 20 kV to 33 kV and cable laying in a congested urban area.

Preference will be given to candidates who have a sound knowledge of building construction, including layout and design of substations, offices and service centres. Further duties would include the control and direction of a team of structural draughtsmen and building maintenance work.

Salary: £1,920/£2,085 per annum in accordance with Class L, Grade 3 (Scale 17), of the N.J.B. Salary Scale.

(3) THIRD ASSISTANT ENGINEER (Planning and Development)
REF. No. GE/29/61.

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification and should have a sound engineering training with subsequent experience in the design and layout of large distribution systems at pressures up to and including 33 kV in a densely loaded industrial and residential area. A knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams is desirable.

Salary: £1,190/£1,325 per annum in accordance with Class L, Grade 10 (Scale 10), of the N.J.B. Salary Scale.

(4) FOURTH ASSISTANT ENGINEER (Meter, Test and Protection)
REF. No. GE/30/61.

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification. The successful candidate will be primarily concerned with the installation and *in situ* testing of polyphase metering and ancillary equipment. Experience in the use of potentiometer equipment to comply with the requirements of the Electricity Supply (Meter) Act, 1936, will be an advantage.

An oppportunity to gain experience in other work in the section will be given.

Salary: £965/£1,090 per annum in accordance with Class L, Grade 13 (Scale 7), of the N.J.B. Salary Scale.

The successful candidates for these posts shall be required to reside within reasonable travelling distance of Area Headquarters.

Applications, quoting appropriate reference number, should be submitted on the standard application form, which is obtainable from the Area Secretary, P.O. Box 6, 75 Waterloo St, Glasgow C.2, and should be returned not later than Friday, 19 May, 1961.

(A 498)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
SUTTON DISTRICT

SALARY: £965/£1,090 per annum under N.J.B. Class G, Grade 9, plus London Allowance. Superannuable. Applicants should have a good general education, be technically trained up to H.N.C. standard and must have had practical experience in general distribution work on H.V. and L.V. systems. Ability to plan and prepare schemes for mains extensions would be an advantage. Consideration will be given to a private car allowance. Assistance in house purchase in appropriate circumstances and a Board-owned flat may be made available to a suitable applicant on a temporary basis if required.

Applications on forms from District Manager, Seeboard, 52 High St, Sutton, Surrey, by 17 May, 1961.

LADY DEMONSTRATOR
WEALD DISTRICT

Salary: £625 x £25—£700 per annum under N.J.C. Grade 1. Superannuable. Applicants should possess a recognised diploma or certificate in domestic science and also E.A.W. certificate. The successful applicant will be based at the district office and for duty anywhere in the district, including generally assisting in showrooms. She will be required to conduct lectures and demonstrations. Must be prepared to work on Saturday afternoons if showroom opening times warrant this.

Applications quoting ET and naming two referees to District Manager, Seeboard, Fairview, Highgate, Hawkhurst, Kent, by 19 May, 1961.

GEORGE WRAY,
Secretary.
(A532)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for the post of

SHIFT CHARGE ENGINEER
RANNOCH POWER STATION

Applicants should have preferably technical qualifications up to H.N.C. standard or equivalent and must have had some experience in the Electricity Supply Industry, generation or distribution. The post, which is superannuable, carries a salary scale N.J.B. Grade F/7, Scale 8 (£1,040/£1,165) plus 10% shift enhancement. A house will be made available at an agreed rent to the successful candidate after a short training period, if this is necessary.

Applications on the standard Application for Post Form, copies of which can be had on request, should be addressed to the Generation Engineer, Tummel Valley Group, Tummel Bridge, Pitlochry, Perthshire, within 14 days. (A 509)

ELECTRICAL CONTRACTORS

South England, require young energetic men capable of obtaining and supervising installations of all types and sizes. Progressive terms of employment. Send full details of experience, etc., Box No. 8279, Electrical Times. (A 496)

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

CLERK OF WORKS (ENGINEERING)

REQUIRED to assist Senior Clerk of Works in supervision of engineering works at Welwyn/Hatfield new hospital now under construction. This is a new appointment expected to last for at least two years. Applicants must have served an apprenticeship in mechanical or electrical engineering and have had not less than five years' experience supervising site installations. They must be capable of supervising both mechanical and electrical work.

Salary within scale £800/£1,050.

Apply, stating age, qualifications and experience, with names of two referees (preferably employers) to Secretary, North West Metropolitan Regional Hospital Board, 40 Eastbourne Terrace, W.2, by 15 May, quoting reference 924. (A 530)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL)
SPONDON POWER STATION
Vacancy No. 91/61.

APPLICATIONS are invited for the position of Assistant Maintenance Engineer (Mechanical) at the Spondon Power Station, Thulston Rd, Borrowash, near Derby.

Applicants should have received a sound technical training and wide practical experience in the maintenance of Power Station mechanical plant, particularly Turbo-Alternators, and must be capable of planning and supervising mechanical plant maintenance.

Preference will be given to candidates who are Corporate Members of an appropriate Professional Institution or hold qualifications leading to such membership.

The salary will be in accordance with Class J, Grade 8 (£1,190/£1,325 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 19 May, 1961.

ASSISTANT ENGINEERS (RELIEF)
COVENTRY POWER STATION
Vacancy No. 92/61.

Applications are invited for the positions of Assistant Engineers (Relief) at Coventry Power Station, Alderman's Green, Coventry.

Applicants should have received a sound electrical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in mechanical or electrical engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class G, Grade 12 (£765/£870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications: 19 May, 1961.

The appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned, and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.
(A 522)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division

Vacancy No. 91/ET/61.

APPLICATIONS invited for the appointment of:

STATION SHIFT CONTROL ENGINEER

Carmarthen Bay Power Station, Burry Port, Carms.

Salary: Schedule A, Class K, Grade 10, Scale 9, £1,115/£1,245 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 20 May, 1961. (A 523)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER

REQUIRED in the Technical Department, No. 1 Sub-Area Headquarters, Liverpool. Salary within range £1,040/£1,165 per annum (N.J.B. Class M, Grade 13).

Applicants should have had experience in the testing and commissioning of protective systems and associated equipment. Experience in the localisation of faults on h.v. systems would be an advantage. Technical qualifications desirable.

Appointment subject to medical examination. Pension Scheme.

Special application forms, obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3, should be completed and returned to him not later than 19 May, 1961. (A 525)

FULLER ELECTRIC LTD.

have the following vacancies in their technical sales department:

ELECTRICAL ENGINEER

with induction heating or melting experience to handle technical and commercial aspects of this type of equipment.

ELECTRICAL ENGINEER

with knowledge of H.V. switchgear and generating plant who will be responsible for contracts from the initial stage of discussions with customers to the completion of work and commissioning. Applicants should be qualified engineers preferably between 25 and 35 years of age.

Salary will be commensurate with experience and qualifications, but not less than £1,000 per annum.

Apply stating age, experience and present salary to:

FULLER ELECTRIC LTD.,
Fulbourne Rd, Walthamstow, London E.17.

(A 536)

BRUSH

(A member of the Hawker Siddeley Group—Industrial Division)

DRAUGHTSMEN

Transformers
Switchgear
Rotating Electrical Machines
Motor Control Gear
Electric and Diesel Electric Locomotives
(Mechanical, Control Gear and Electrical Machines)
General Engineering

If you are a qualified Draughtsman and interested in one of the above vacancies, please apply to *Mr. A. Garner, Brush Electrical Engineering Company Limited, Loughborough, Leicestershire,* quoting reference: PL.9936 and giving brief details of your qualifications and experience.

ALL APPLICATIONS WILL BE TREATED IN THE STRICTEST CONFIDENCE.

The Company is situated some 15 miles from Leicester, Nottingham and Derby on the outskirts of a small town amid the pleasant Leicestershire countryside and away from the smoky industrial environment. Schooling facilities are good for all grades of education, including advanced studies at Technical Colleges and Universities in the district. In appropriate cases assistance with housing and removal expenses can be considered.

(A 416)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

South Staffs and North Worcs Area

GENERAL ASSISTANT DISTRICT ENGINEER (WEDNESBURY)

Applicants should have suitable technical qualifications and training in engineering duties associated with electricity distribution systems. Salary: £715/£805 per annum (N.J.B. Grade J.15). Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr D. Holt, Acting Area Manager (Ref. EMI/SEC), Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton, Staffs.

North Staffs Area

SECOND ASSISTANT DISTRICT ENGINEER (STOKE SOUTH)

Duties include the construction, operation and maintenance of H.V. and M.V. mains and substations, up to and including 33 kV. Applicants should preferably have had experience in organisation and control of construction work on H.V. and M.V. underground and overhead mains and substations in an industrial District. Technical qualifications desirable. Salary: £1,115/£1,245 per annum (N.J.B. Grade G.7). (It is expected that the District will shortly be reclassified to H.) Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr C. C. Pimble, Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

Worcestershire Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (STRATFORD-ON-AVON)

The successful applicant will be required for duties in connection with the organisation and supervision of the contracting and appliance repair and maintenance service. Applicants should have had a sound technical training, and a wide experience of installation practice. Salary: £765/£870 per anunm (N.J.B. Grade E.10). Apply, by letter, within 14 days, stating age, experience, qualifications, present position and salary, to Mr R. Mallet, Area Manager, Midlands Electricity Board, P.O. Box 52, Blackpole Rd, Worcester.

F. W. CATER,
Secretary.
(A 505)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Clyde Area

DISTRICT COMMERCIAL ENGINEER (CLYDEBANK DISTRICT)

APPLICATIONS are invited for the above post.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, have experience in the various applications of electricity, have a knowledge of installation work and be conversant with tariffs, sales and all aspects of service to consumers.

The terms and conditions of employment will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry.

Salary Scale: £1,440/£1,610 per annum, Class G, Grade 3.

The successful candidate will require to reside within reasonable distance of the District Office, Clydebank.

Application on the standard form, obtainable from this office, should be sent to the undersigned within 14 days of the appearance of this notice.

H. B. BRUCE,
Manager.

P.O. Box 15,
206 St. Vincent St,
Glasgow C.2.
20 April, 1961. (A 500)

LAING

MECHANICAL AND ELECTRICAL SERVICES

JOHN LAING AND SON LIMITED require ENGINEERS and DRAUGHTSMEN for design, specification and Site Supervision of Installations in major Industrial and Commercial Developments.

Experience and training desirable in one or more of the following fields:

Electrical Installations.
Heating, Ventilating and Air Conditioning.
Industrial Processes.

Appointments are available for both qualified Engineers and unqualified assistants.

These are interesting and progressive posts offering opportunities for further study and experience.

The Company operates a Pension Scheme, and offers good conditions of employment.

Applications, giving brief details, should be sent to Group Personnel Manager (ME7), John Laing and Son Limited, London N.W.7. (A 484)

ADMIRALTY—NAVY WORKS DEPARTMENT ENGINEERING DRAUGHTSMEN ELECTRICAL AND MECHANICAL

Vacancies exist in Navy Works Department Drawing Offices at the following Establishments: Pinner (Middlesex), London, Chatham, Portsmouth, Portland, Devonport, Milford Haven, Liverpool and Rosyth and occur elsewhere in the United Kingdom from time to time.

The posts are non-pensionable but there will be opportunities for transfer to the Established staff.

Applicants must be competent Draughtsmen and experienced in one or more of the following types of work:

Electrical

(a) Preparation of specifications, drawings and schedules for electrical equipment. Précis of firms' tenders.
(b) Electrical installations in domestic and industrial buildings.
(c) Cable installations, switchgear, etc.
(d) Airfield lighting.
(e) Low Tension Power distribution systems and Telecommunications Wiring.

Mechanical

(a) Preparation of specifications, drawings, schedules for Mechanical Equipment. Précis of firms' tenders.
(b) District heating, including boiler installations, heating and air conditioning of domestic and specialist buildings.
(c) Layouts of engineering installations and workshop machinery.
(d) All classes of lifting appliances, pumping installations, test plants, cooking equipment, etc.

Possession of O.N.C. or similar qualification will be an advantage. Consideration will be given to successful candidates being granted assistance to obtain technical qualifications.

Salary (Men): National Rate—subject to slight variation dependent on location: starting from £603 (at age 21) to £905 (28 and over); maximum of scale—£993 p.a. (National Rate).

Opportunities occur for promotion to Leading grade—salary maximum £1,160 p.a. (National Rate).

Five-day week; annual leave 18 days, rising to 22 after ten years.

Candidates, who must be British subjects, are invited to apply in writing, giving details of qualifications and experience to Director General, Navy Works, Admiralty, Chamberlain Way, Pinner, Middlesex, quoting ref. 45/96/125.

(A 461)

ELECTRICAL DESIGNER

with experience or knowledge of a.c. variable speed commutator motor design. Successful applicant will be a senior member of a small production and development team.

Apply stating age, experience, qualifications and present salary to:

FULLER ELECTRIC LTD.,
Fulbourne Rd, Walthamstow, E.17.
(A 535)

ELECTRICAL ENGINEER

required by

UNITED KINGDOM ATOMIC ENERGY AUTHORITY

to be responsible for the installation and maintenance of electrical plant associated with Reactors and Chemical Plant at Dounreay Experimental Reactor Establishment.

Applicants must have served a recognised engineering apprenticeship or pupilage and be at least graduate members of the Institution of Electrical Engineers or have equivalent qualifications.

Salary between £1,005 (at age 25) to £1,535.

Rented housing and house purchase assistance available for married officers living beyond daily travelling distance. Hostel accommodation available. Contributory superannuation.

Send post card for application form to:

Personnel Manager,
U.K.A.E.A., Reactor Group,
E.R.E., Dounreay, Thurso, Caithness
quoting reference 226/49.
(A 501)

PHILIPS ELECTRICAL LTD

require for their Midlands Lighting Design Department a

SENIOR PLANNING ENGINEER

capable of supervising the design of lighting schemes and preparation of specifications, quotations, etc.

Suitable applicants, aged 25-35 years, should have similar experience and lighting knowledge up to Intermediate City and Guilds standards in Illuminating Engineering.

This is an attractive permanent position with opportunities of promotion and development to suitable candidates who should write in the first instance to the

Midlands Regional Manager,
Philips Electrical Ltd.,
1 St. Paul's Sq,
Birmingham 3.
(A 495)

LONDON TRANSFORMER PRODUCTS LTD.

require the following technical personnel for employment at their main works in Bridgend, Glam. The offices are situated in pleasant country surroundings in the vale of Glamorgan and five miles from the sea.

(1) SENIOR TRANSFORMER DESIGNER

with considerable experience of various types up to 5 MVA. Realistic initial salary together with progressive increases. A company house on advantageous terms is available to suitable applicant, preferably in age group 30-40.

(2) JUNIOR TRANSFORMER DESIGNER

with some experience of power and distribution units and with technical qualifications up to H.N.C. level. Initial salary according to experience together with progressive increases.

Application re (1) and (2) *to Chief Designer.*

(3) TRANSFORMER DRAUGHTSMEN

with experience on Distribution and Power Transformers up to 5 MVA. Salary according to age and experience. Application re (3) to Chief Draughtsman.
(A 448)

ENGLISH ELECTRIC

AIRCRAFT EQUIPMENT DIVISION

A newly formed design office in LONDON requires several experienced

ELECTRICAL MACHINE DESIGNERS

to join a team working on the design and development of aircraft electrical equipment and systems. The team will be backed up by extensive laboratory facilities at the Works and also by computing facilities in London.

Applicants should be qualified Engineers and have had previous machine design experience, preferably in the field of small a.c. and d.c. machines (5 watts to 100 kilowatts). Experience in the aircraft or guided weapons field, whilst not essential, would be preferred.

Please write, giving details of qualifications and experience, to Chief Engineer, A.E.D., c/o Dept. G.P.S., English Electric Hse, Strand, London W.C.2, quoting reference ET 296 C.

(A 542)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division
Vacancy Notice: ET/AV/44/61.
GENERAL ASSISTANT ENGINEER
(TECHNICAL RECORDS)

REQUIRED at Plymouth "B" Generating Station.

Superannuation Scheme. Salary: N.J.B. Class J, Grade 15, Scale 3, £715/£805 per annum.

Candidates should preferably have possession of, or be studying for, a Higher National Certificate or similar qualification.

This post presents opportunity for gaining operational experience.

Applications on Form AE6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 15 May, 1961. (A 527)

LONDON ELECTRICITY BOARD
ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's West Bourne District at 63-81 Pelham St, S.W.7.

Candidates should have a good general and technical education and be in possession of the Ordinary National Certificate, be neat and capable draughtsman and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 13, £875/£990 per annum, inclusive of London Allowance.

Applications, stating age, qualifications and experience, should be sent direct to the Manager at the above address within 14 days of the publication date of this notice. Please quote Ref.: PER/V/3236/T. (A 528)

REPUBLIC OF THE SUDAN

APPLICATIONS are invited to fill the post of
AREA ELECTRICAL ENGINEER
Blue Nile Area, with the Central Electricity and Water Administration, Sudan.

Applicants should be suitably qualified engineers with Corporate Membership of the Institution of Electrical Engineers. They should have considerable experience in the operation, maintenance and construction of distribution systems up to 11 kV. Experience on higher voltage equipment would be an added advantage. The work covers a very large area where electrical development is limited, but where very large expansion will take place in the immediate future. The official appointed will be required to assist in the training of Sudanese Engineers.

Salary offered is in the present range of £S.1,750/£S.2,125 and point of entry will be fixed according to age and experience. In addition a cost of living allowance of £S.187 per annum is payable. A contract of from three to five years including 12 months on probation is envisaged and a bonus of 10% of basic salary earned during contract is payable on completion. An outfit allowance of £S.50 is payable on appointment. There is no income tax in the Sudan at present. (£S.1—£1 0s 6d.)

Hard furnished accommodation is provided at a rent not exceeding 7½% of the basic salary. Free medical treatment is provided for official and his family.

Home leave is granted at the rate of 82 days per annum and during a five-year contract a total of 410 days' leave is earned. The first leave is granted after 18 months' service in the Sudan and amounts to 110 days. In each subsequent 12 months, 82 days' leave are granted and the remaining balance is taken to expire on completion of the contract. Free air passages for the official and his family.

Application should be made, in the first instance, stating age, qualifications and experience and submitting copies of recent testimonals, to the Appointments Section, Sudan Embassy, 3 Cleveland Row, St. James's, London S.W.1.

Closing date: 20 May, 1961. (A 502)

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD
Expansion of Building Programme
PROFESSIONAL ELECTRICAL ENGINEERS

MAIN Grade Engineers are required for the staff of the Engineer to the Board. The posts are permanent and pensionable and offer considerable career prospects owing to the vast expansion of the hospital building programme.

Those appointed will be members of a team designing engineering services for new hospitals, extensions, etc. They will work under the general control of an experienced professional engineer, but they themselves will be responsible for the design and management of individual schemes.

The work is complex in nature and extremely interesting and offers a challenge to those who want more than the usual run of job.

Applicants should be A.M.I.E.E., but Graduate Members of this Institution will be acceptable.

The salary will be within the range of £950/£1,650. The starting salary can be above the minimum in respect of relevant experience and qualifications, and in the case of Corporate Members will not be less than £1,210.

Applications stating age, qualifications, experience, present appointment and salary, together with the names and addresses of two referees, should be sent to the undersigned at 40 Eastbourne Terr, London W.2, by not later than 15 May.

E. G. BRAITHWAITE,
Secretary.
(A 507)

LONDON ELECTRICITY BOARD
DRAUGHTSMEN

APPLICATIONS are invited for vacancies in the Engineering Drawing Office at Lesco Hse, Stamford St, S.E.1.

ENGINEERING DRAUGHTSMEN
(PER/V/3270/T.)

Duties will include the design and layout of main substations; alternatively surveying on site and constructional details in connection with the laying of E.H.V. transmission cables.

Candidates should have received a good general and technical education and possess the Ordinary National Certificate in electrical or mechanical engineering.

The posts are graded under Schedule B of the National Joint Board Agreement as Class BX, Grade 12, £830 per annum, rising to £1,140 per annum; alternatively, Grade 13, £780, rising to £1,065 per annum respectively, each inclusive of London Allowance.

DRAUGHTSMEN (PER/V/3271/T.)

Duties will include the recording of E.H.V. transmission mains.

Applicants should preferably be not less than 22 years of age and have experience in mains recording.

The posts are graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 2, i.e.: £700/£775 per annum, plus the appropriate London Area Allowance.

Applications stating age, qualifications and experience and quoting appropriate reference number, should be sent direct to the Chief Technical Officer at the above address, within 14 days of the publication date of this notice. (A 531)

ASSISTANT ELECTRICAL ENGINEERS with at least H.N.C. and 2/3 years' experience of E.H.V. Transmission Work required by Consulting Engineers in their Contracts and Design Department, Weybridge. Applications stating age, qualifications, experience and salary required to Kennedy and Donkin, 12 Caxton St, London S.W.1, quoting Ref. RWMc. (A 463)

CABLE ESTIMATOR required. State age and experience. — Wandleside Cable Works Ltd., 106 Garratt La, Wandsworth, S.W.18. (A 499)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

BRANCH MANAGER required by electrical wholesaler in London. Experience in controlling sales of £250,000 per annum essential. Remuneration will be negotiated but will be high for the right executive. Position provides prospects of considerable advancement. Applications to Box No. 8281, Electrical Times. (A 497)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., Longridge Hse, Manchester 4. ELECTRICAL SURVEYOR required. Permanent position carrying progressive salary scale £825/£1,225 with non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (A 519)

BBC requires TWO ENGINEERS (British subjects only) for their Planning and Installation Department. One post (A) (salary range: £1,380 p.a./£1,780 p.a.) covers responsibility for the specification, supervision of installation and commissioning of a wide range of power equipment required for transmitter and studio premises of the Corporation, including H.V. switchgear, transformers, rectifiers and standby generating plant. The second post (B) (salary range: £1,230 p.a./£1,555) is for an Engineer to undertake planning and installation work associated with power supplies to transmitter and studio premises. The plant concerned involves H.V. switchgear, transformers, rectifiers, standby diesel alternators, control circuitry and associated cabling and wiring installations. Both posts are based in London, but will cover Corporation sites throughout the country, and will provide opportunities of obtaining experience of the wide range of the BBC's engineering activities. Applicants for either post should have a University degree or appropriate Higher National Certificate, and have served an apprenticeship with a manufacturing organisation with subsequent experience relevant to the types of plant listed. Write for application form to Engineering Recruitment Officer, quoting reference 61.E.96 ET., A or B, British Broadcasting Corporation, Broadcasting Hse, London W.1. (A 541)

EXPERIENCED MALE ASSISTANT for Manager of new division of leading Appliance Manufacturers. Preferred age 21-26. Good salary and prospects. Apply Manager, Food Mixer Division, Berry's Electric Ltd., 86 Newman St, W.1. (A 511)

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REPRESENTATIVE or AGENT for London and Home Counties, required by electrical space heater manufacturers. Must have live connections with electricity boards, local authorities, architects and consultants. Reply in confidence to Box No. 8287, Electrical Times. (A 538)

SENIOR ESTIMATING and SUPERVISING ENGINEER required by national electrical contractors for Yorkshire area office. Excellent prospects to suitable man, pension scheme. Write stating age, salary and experience. Box No. 8285, Electrical Times. (A 537)

PATENTS

THE proprietor of British Patent Numbers 790872 and 791172, entitled "Closure for Mixing Vessels" and "Speed Control Device for Electrically Driven Machines," respectively, offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 140 South Dearborn St, Chicago 3, Illinois, U.S.A. (A 459)

Classified Advertisements continued on page 48

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THE Proprietors of British Patent No. 790,315 for "Improvements in or relating to Separators for Storage Batteries and method of making them" are desirous of entering into negotiations for the sale of the Patent, or for the grant of a licence thereunder. Communications should be addressed to Page, White and Farrer, 27 Chancery La, London W.C.2. (A 534)

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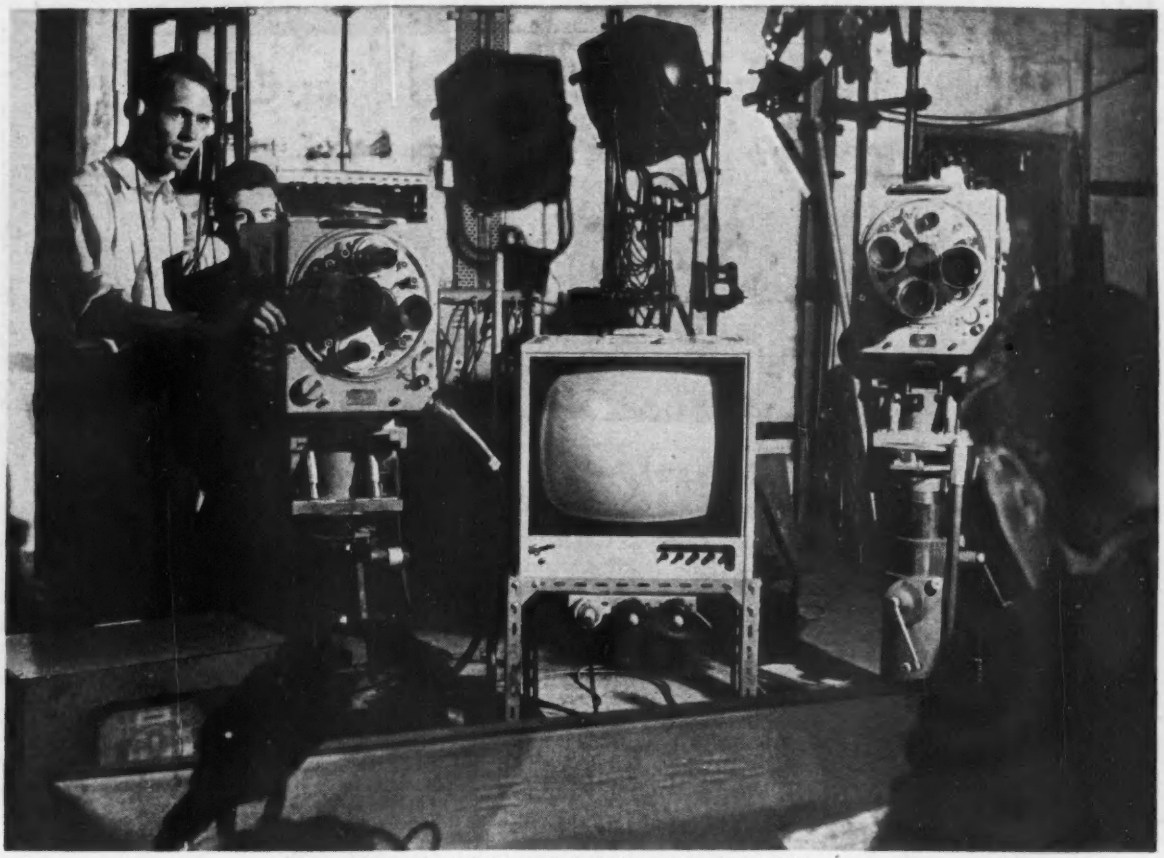
(A 539)



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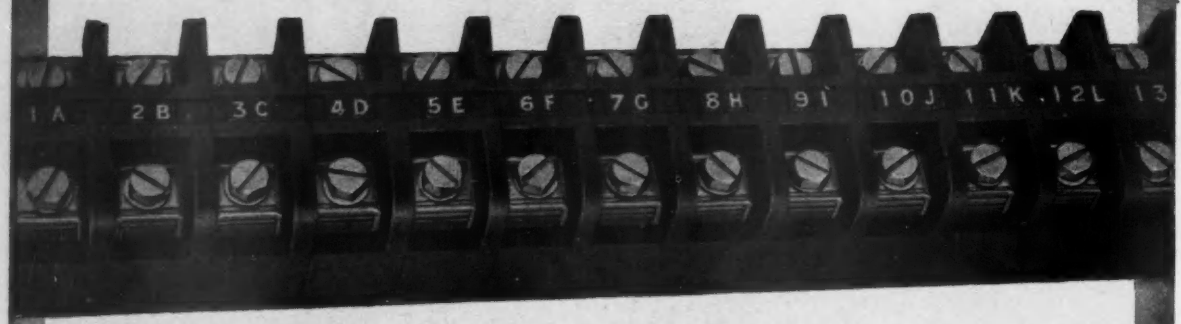

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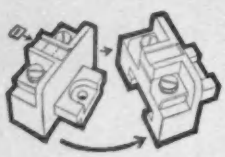

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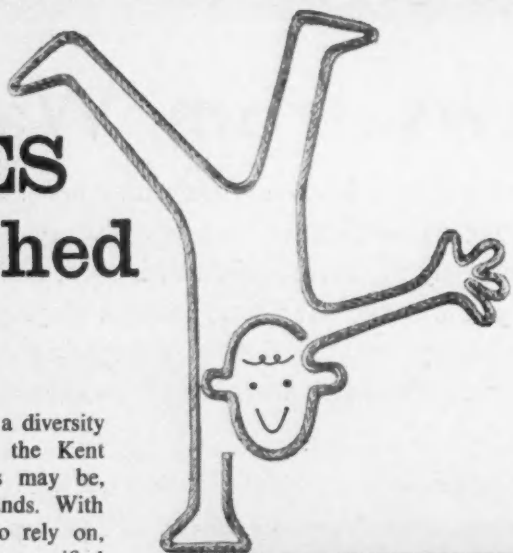

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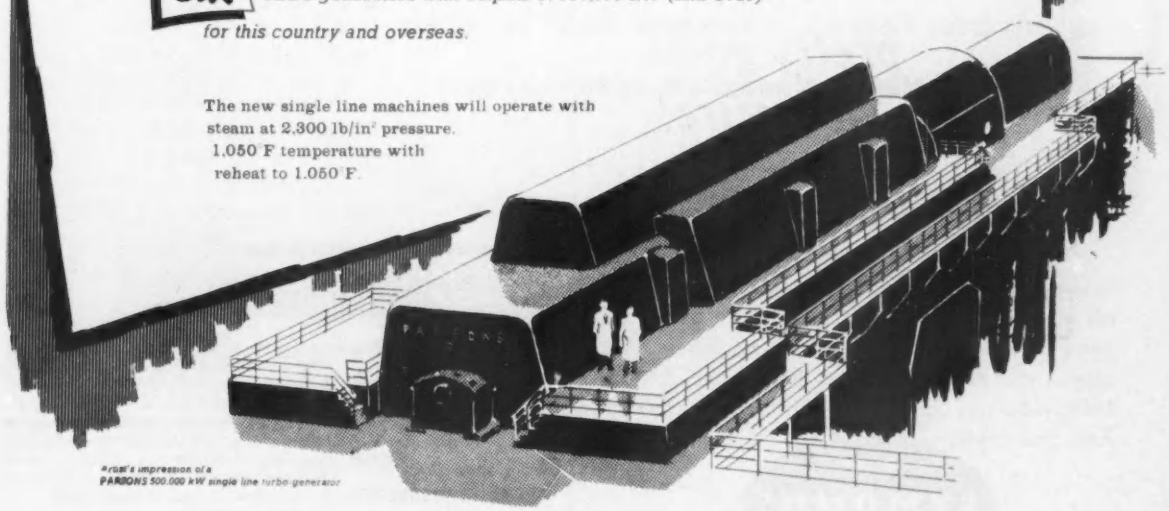

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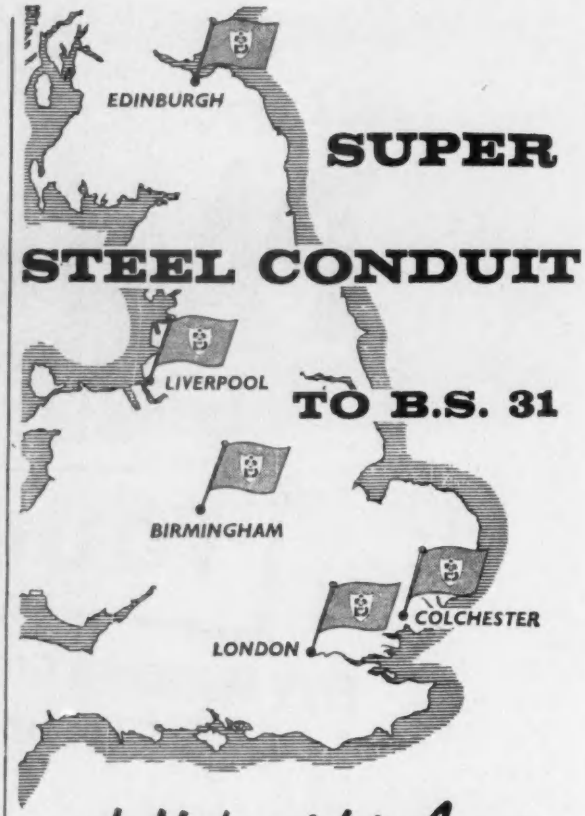

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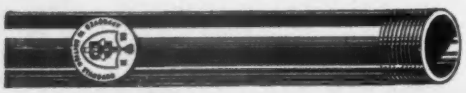

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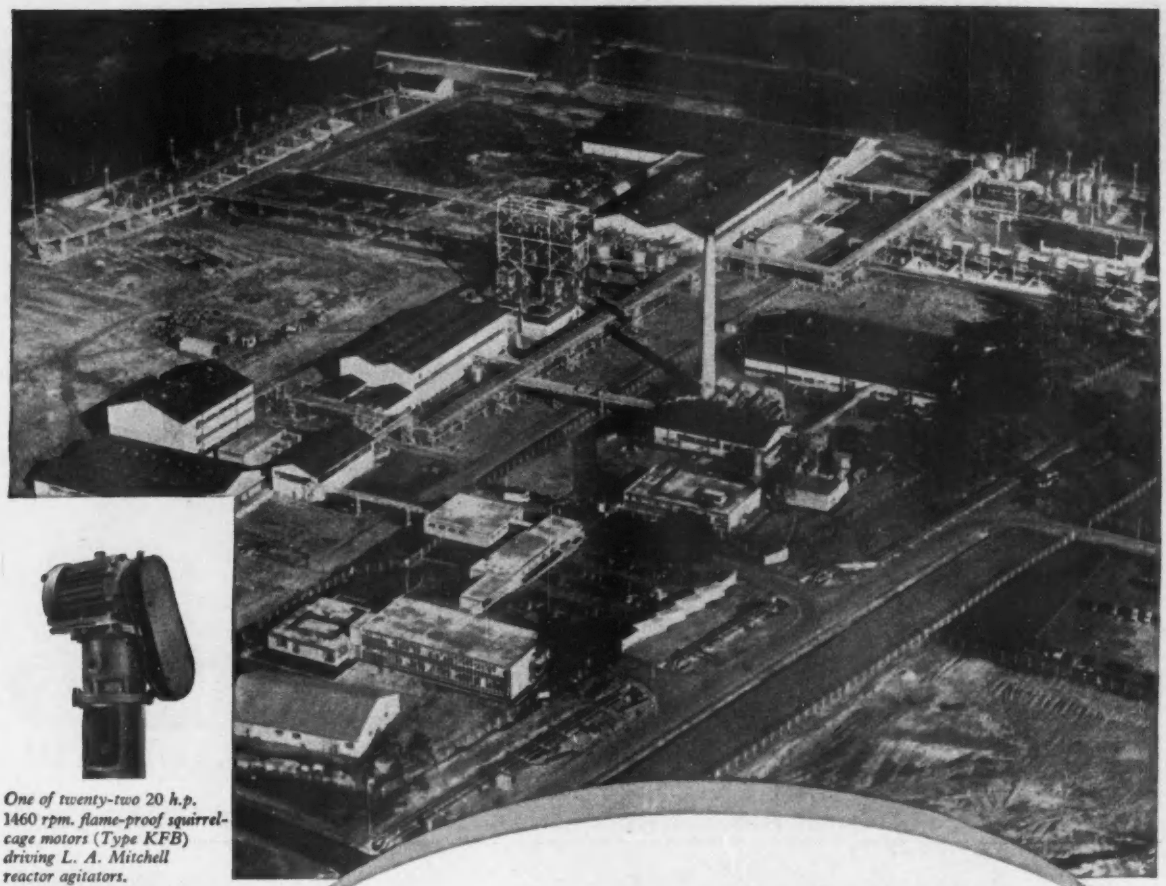

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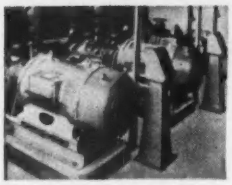

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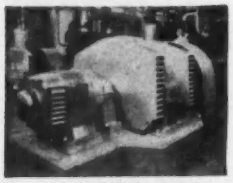

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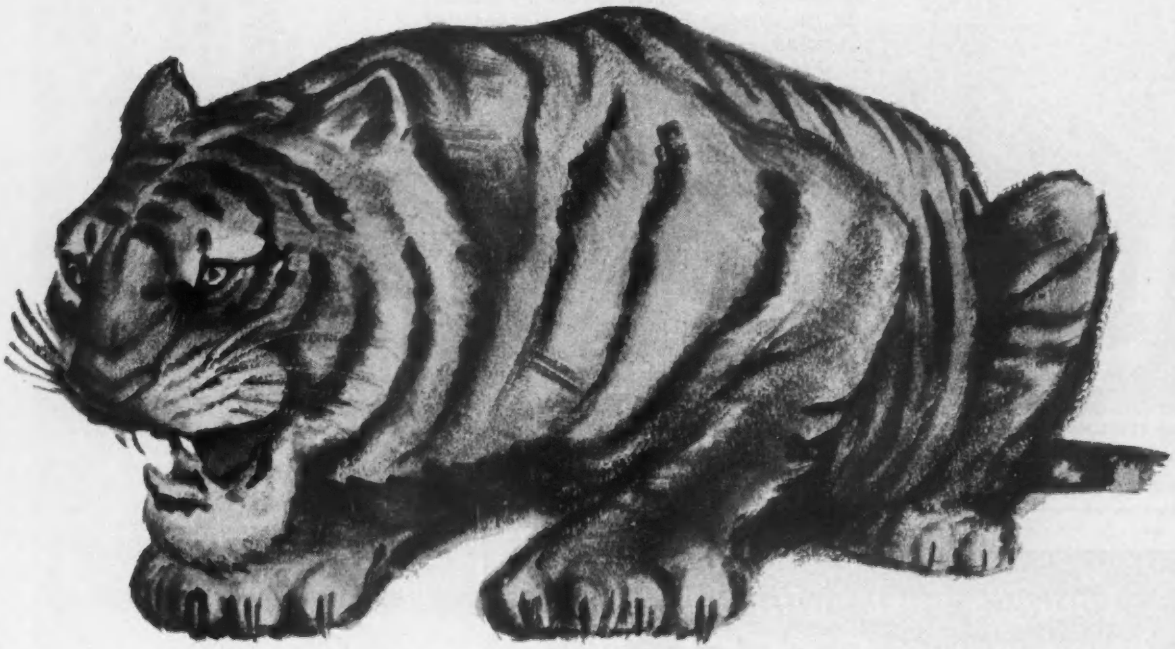

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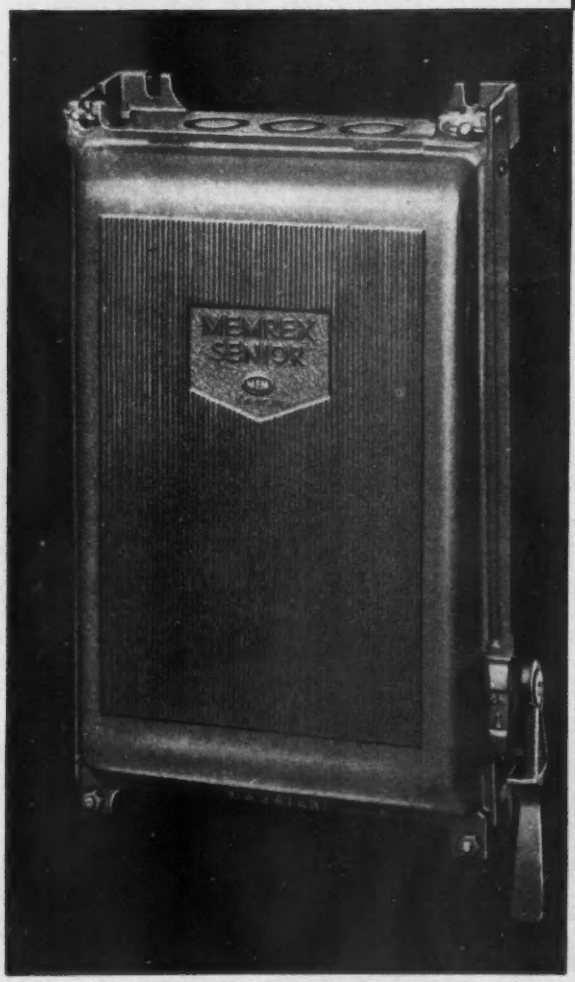

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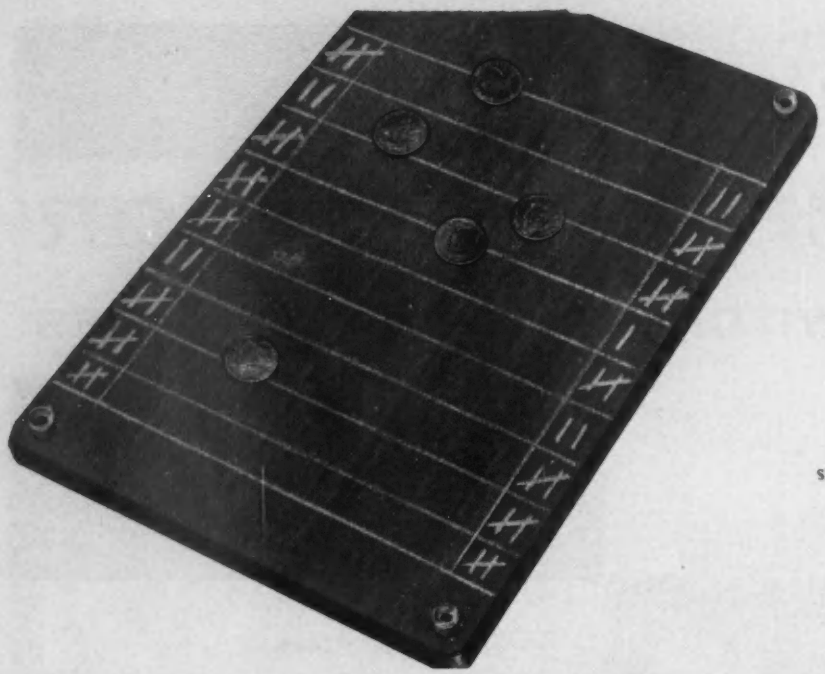

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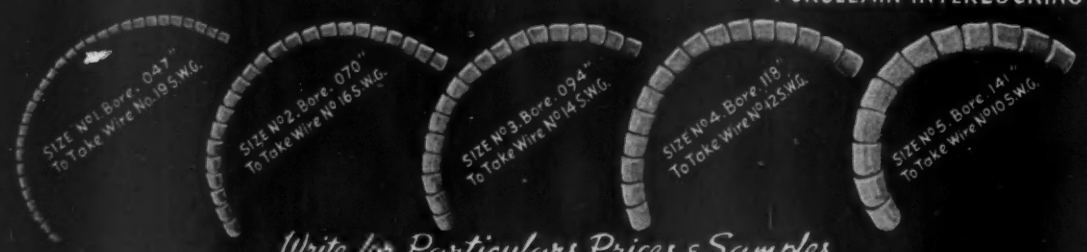
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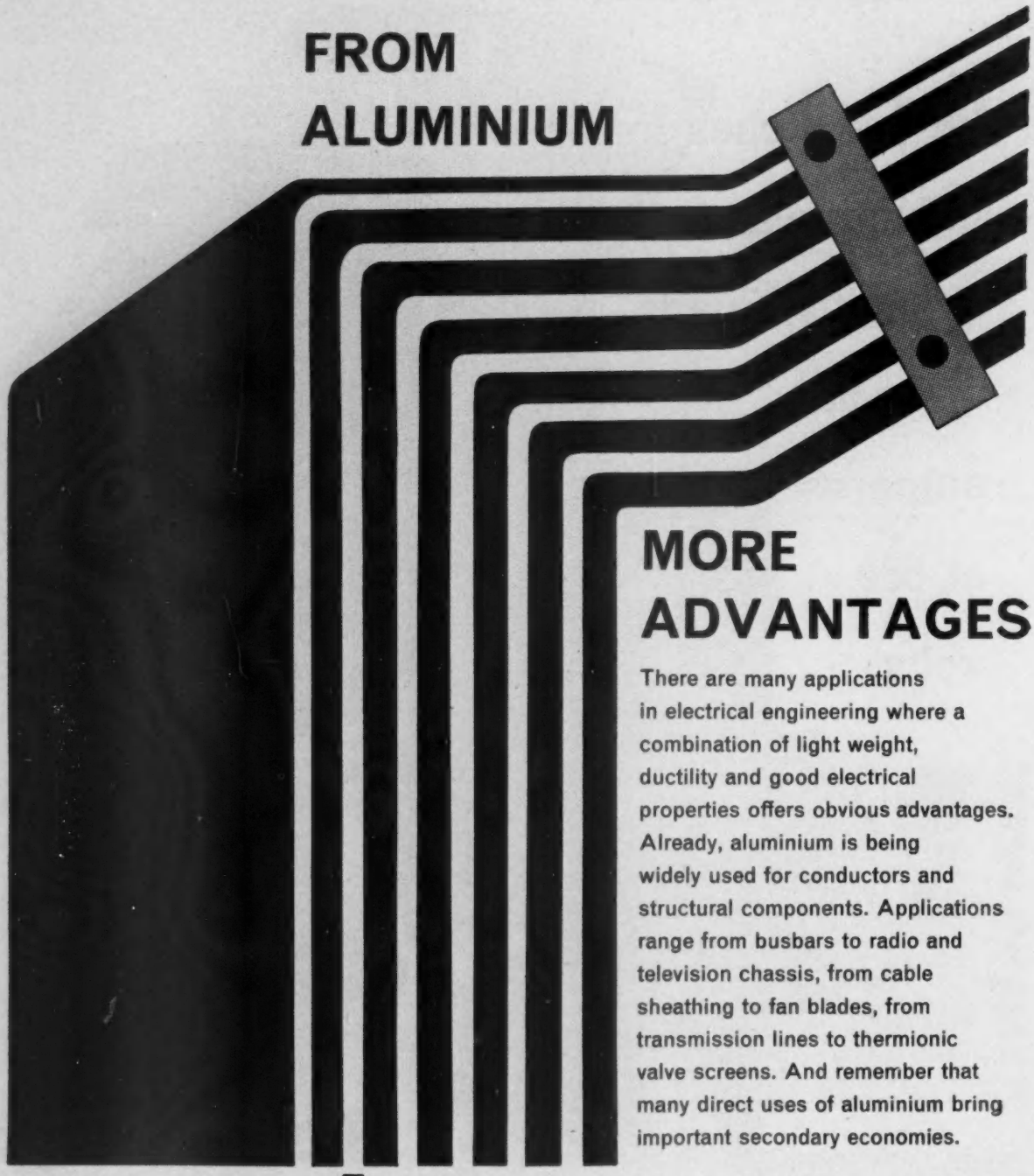

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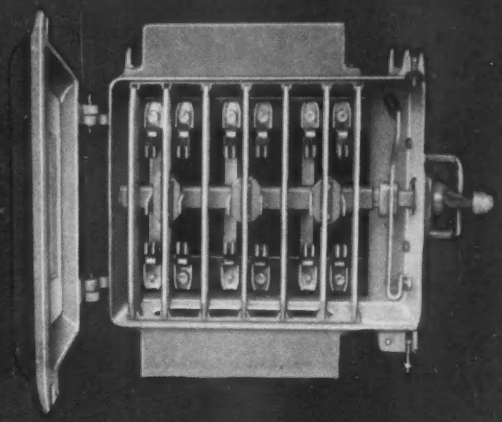

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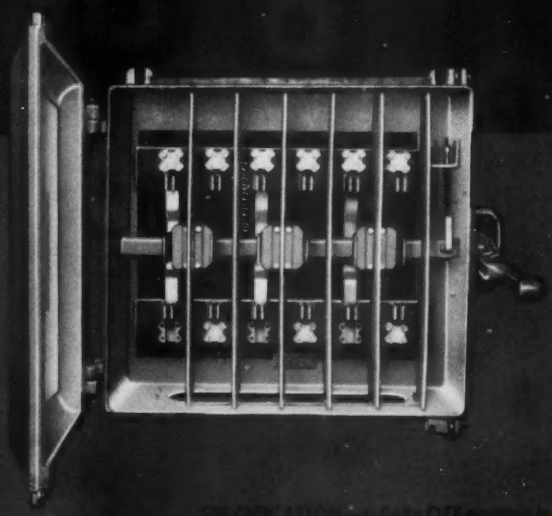

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